

GRASSHOPPER LAND



MARGARET W. MORLEY



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GRASSHOPPER LAND

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GRASSHOPPER LAND

BY

MARGARET WARNER MORLEY

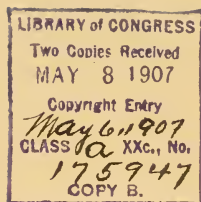
AUTHOR OF "THE BEE PEOPLE," "THE SONG OF LIFE," "THE RENEWAL
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Published May 4, 1907

Entered at Stationers' Hall, London, England.

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THE UNIVERSITY PRESS, CAMBRIDGE, U.S.A.

Foreword

THIS book is not for children. It is for their grandfathers and grandmothers who were once boys and girls in the country, and who may be in danger, after all these years, of forgetting about grasshoppers. If the children persist in reading so old a book they must not grumble at the long words, but quietly hunt them up in the dictionary, or else wait until they themselves are grandfathers and grandmothers, when they will understand it all quite easily.

M. W. M.

BOSTON, January 1, 1907.

Contents

	PAGE
I THE SUMMER IDLER AND THE GRASSHOPPER . . .	9
II HOW THEY JUMP	16
III CONCERNING THE STRANGE WAYS OF LEGS. . .	33
IV THE GIFT OF WINGS	45
V SONG AND REVELRY	57
VI WONDERFUL POSSESSIONS	71
VII MOLASSES AND OTHER IMPORTANT MATTERS . .	84
VIII SWORDS, STINGS, AND DRILLS	99
IX THE FAMILY TREE	106
X THE SUCCESSFUL MANTIS	110
XI HARMLESS FRAUDS	124
XII THE MIGRATORY LOCUST OF THE EAST	131
XIII WHENCE THEY COME AND WHITHER THEY GO .	157
XIV LOCUSTS AS FOOD	173
XV THE ROCKY MOUNTAIN LOCUST	198
XVI THE DIARY OF A LOCUST	218
XVII OUR EASTERN LOCUSTS	231
XVIII MEADOW GRASSHOPPERS AND KATYDIDS . . .	244
XIX THE CRICKET	260
INDEX	275

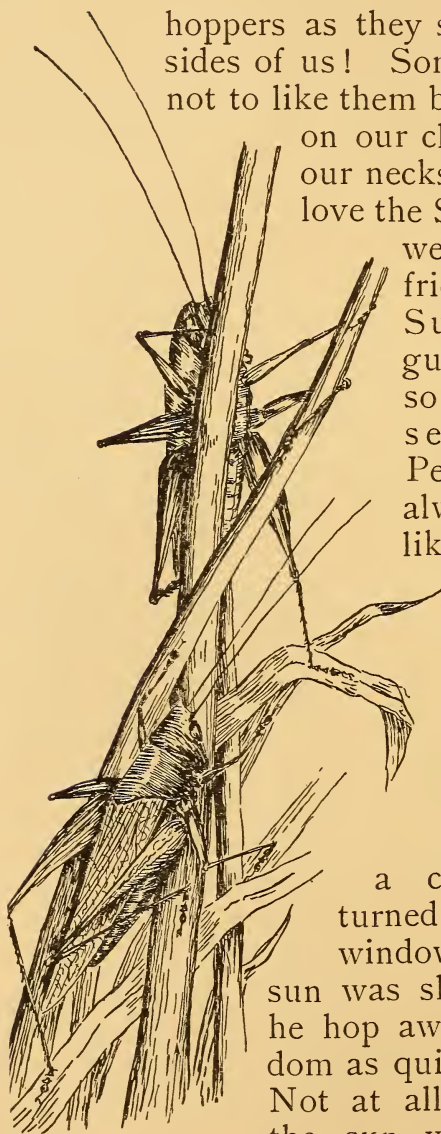
Grasshopper Land

I

THE SUMMER IDLER AND THE GRASSHOPPER

WHO does not love the pleasant Summertime? And to whom of us is it not related, along with sweet fern, ripe apples, and hackmatack, with the song of the grasshopper? Who has not lain on the ground and listened, listened to the mysterious chirping of the hidden choir, or raced over the meadows in pursuit of the frantic fugitive? And who has not, returning triumphant from the chase, soberly requested the captured one to make "molasses" on his finger? To the fortunate dweller in locust-free lands Summer would not quite be Summer without the shrill and pleasant hubbub of the grasshopper folk.

Think of crossing a close-cut New England meadow late in August without stirring up a commotion of whirring wings and hopping legs! Think of walking over the fields without hearing those odd little patterning sounds, like drops of rain, made by the



hoppers as they spring up on all sides of us! Some of us pretend not to like them because they land on our clothes and tickle our necks, yet if we truly love the Summer how can

we help having a friendly feeling for Summer's little guests? They are so alive and they seem so happy! Perhaps they are always happy, but like ourselves they

are happiest when the sun shines. Once a captured one that had been kept in the house for several days during

a cold storm was turned loose on the window-sill where the sun was shining hot. Did he hop away to surer freedom as quickly as possible? Not at all. The touch of the sun was so delicious

that he instantly lay down on one side like a cat and stretched out his legs as far as he could get them. Thus he remained basking for an hour or more. It was a funny sight, and from his attitude we knew that he was sunning himself as surely as though he had been able to tell us so in words.

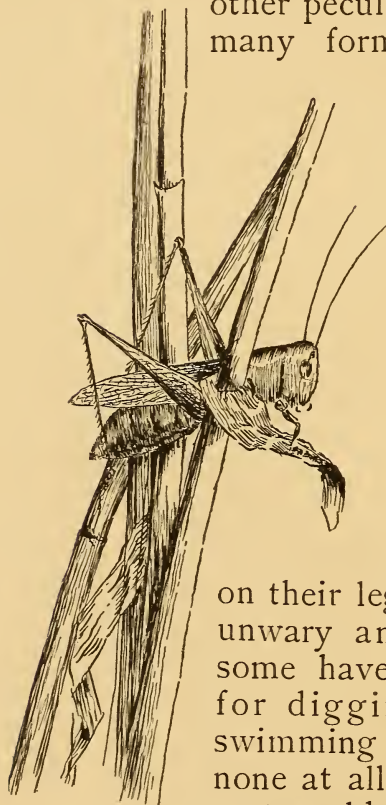
That which endears the grasshopper to every one of us, old or young, is undoubtedly his long hind legs. Without these he would be nobody, he could not have so jolly a name, he could not attract our pleased attention or startle us occasionally when we go walking. Minus his audacious legs, he would seem to us little more than an embodied chirp, which we should listen to with slight interest.

Every creature is distinguished in some way,—the butterfly for its bright colors, the bee for its honey, the ant for its wisdom; it remains for the grasshopper to jump into notice.

Everybody knows how a grasshopper jumps,—at least every one thinks so; yet who of us really does know? Perhaps we think it of no consequence; yet if we fully understood it, there would be very little left to puzzle over in this very puzzling world of ours, and Archimedes himself would have to take off his hat to us.

There is no doubt that the long hind legs

are somehow responsible for most of the grasshopper's acrobatic performances, as they may also be responsible for some of his other peculiarities; for there are many forms of legs in the



world, and not all, be it remembered, are mere stilts to walk on. The grasshopper, for instance, sometimes has them of such superior make that he can hear with them and sing with them, as well as outjump most of his rivals. Some insects have traps

on their legs for catching other unwary and toothsome ones; some have legs that are tools for digging or paddles for swimming; others again have none at all. Indeed, in the insect world legs are very curious, being, according to circumstances, much more or much less than our usual idea of those organs. Since there are so many varieties, it might seem a waste of time to try to understand any of them; but Nature

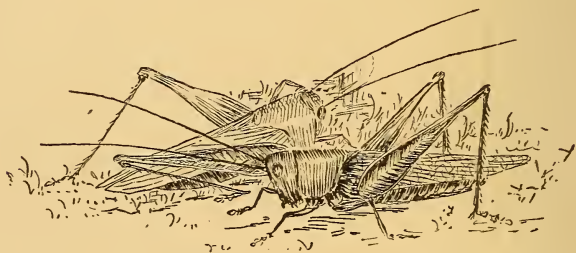
is kind to our limited powers. She has so constructed the legs that, though they differ in details, they are essentially alike, and understanding one we understand all, and a great deal besides that has nothing to do with insects' legs, or with legs at all. Indeed, after we have spent a happy summer day examining—somewhat lazily but yet carefully—the grasshoppers' lively jumpers, we may discover to our satisfaction that they are as interesting as the average novel, and they may be even as profitable.

As we all know, the grasshopper is tolerably supplied with legs, having six. Nor is this accidental, six being the appointed number throughout the insect world. For the grasshopper is an insect, as we know by this very sign of six legs, as well as in some other ways. We can see that he has these six, but we must not stop to ask why he has not eight or four or twenty; if we do, we shall never get any farther, that being one of the apparently simple, but really difficult if not totally unanswerable, questions with regard to his grasshoppership. Enough that the insect world, when legs were in question, settled down on six as the one complete and perfect number for its uses and pleasures.

Right here some one who has used his eyes to good purpose may object that the spider has eight; but that is allowable to

him, because in spite of appearances the spider is not an insect. If the truth were told about the talented fly-catcher, he is closer of kin to a lobster than to a grasshopper.

Naturally the best place to pry into the affairs of the grasshopper is the meadow where he lives; and the pleasantest way for both ourselves and him is to settle down under a shady bush on the edge of a tangle



of goldenrods and asters, where the grasshoppers are blissfully chirping. It is only necessary to keep still and wait a little, when we shall surely be rewarded by the appearance full before our watchful eyes of one or more of the funny folk. Then, if in the course of waiting for one to come, or even while watching it after it has come, the warm sunshine and fragrant odors lull us to sleep, that too is beautiful; for such sleep is the most refreshing sleep in the world, and presently we wake up and go on watching with a delicious sense of renewal, such as

is bestowed only by the magic touch of sun and open air.

Resting thus at ease, we shall see much that has never been written in books, for something new is always sure to be happening, no matter how much we have read or how much we think we know. Our grasshopper is alive; and in this lovely world what two living creatures are exactly alike in appearance or manners? Surely not two grasshoppers!

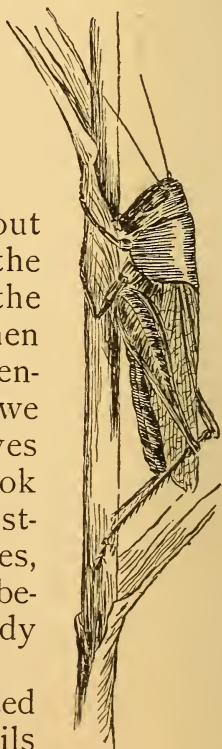
II

HOW THEY JUMP

WE may lie on the warm earth and dream away the golden hours of Summer, certain that this too is work that pays, whether the strenuous world hurrying past our fern bank believes it or not.

But if we would be busy as well as lazy, we can discover much that is delightful about our little neighbors among the grass stalks without making the slightest exertion. Only, when it comes to the final comprehension of long hopping legs, we shall have to bestir ourselves and, catching a grasshopper, look earnestly at it in spite of protesting kicks and profuse molasses, carrying our investigations beyond the legs even to the body of the creature.

To those who declare it wasted time thus to scrutinize the details



of a mere insect the grasshopper might reply:

"I too disapprove, but not on the same grounds. So far as being worthy of attention is concerned, am I not alive? And do you not know that by mere virtue of having life I am related, not only to all other living creatures, but to you, proud grasshopper, who call yourself the lord of creation? Don't you understand that to know me is to know yourself? But let that pass, and open your fingers — I prefer my freedom to your enlightenment."

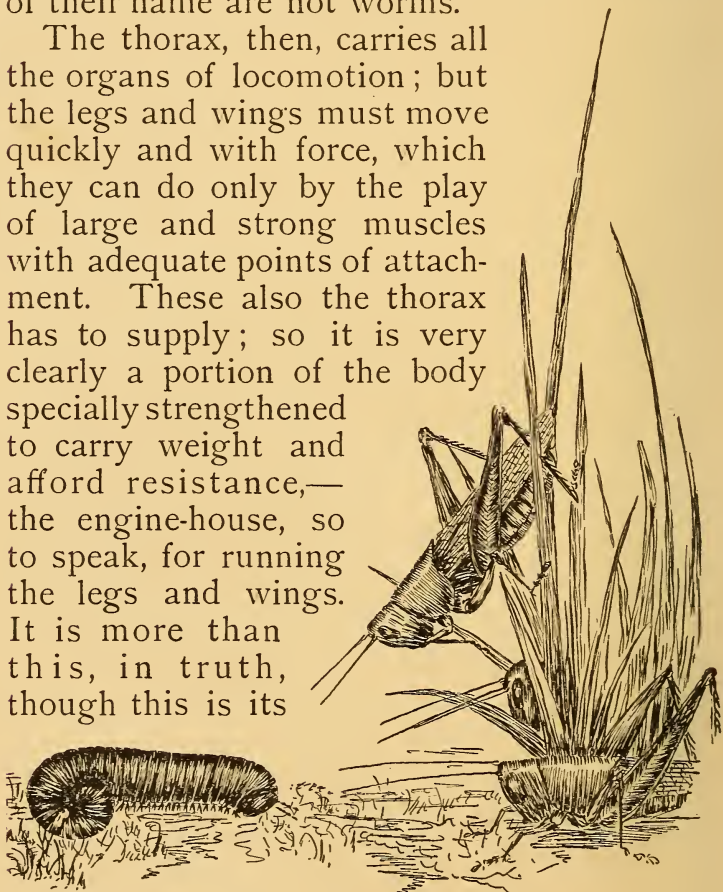
The most noticeable thing about the body of our unwilling captive is that it is clearly divided into three parts,—the head; a short, thick, middle part, known as the thorax or chest; and a long, slender, jointed part or abdomen.



Looking at the bulky thorax with attention, it will presently dawn upon us why it is different from the rest of the body. All the legs and wings are grouped together and fastened to it, the legs to the under part, the wings above. They are grouped together here instead of being scattered the whole length of the body from head to tail, as is

the case in the thousand-legged worms,—which of course are not insects, and in spite of their name are not worms.

The thorax, then, carries all the organs of locomotion; but the legs and wings must move quickly and with force, which they can do only by the play of large and strong muscles with adequate points of attachment. These also the thorax has to supply; so it is very clearly a portion of the body specially strengthened to carry weight and afford resistance,—the engine-house, so to speak, for running the legs and wings. It is more than this, in truth, though this is its



most prominent and individual use.

We should expect, then, to find all insects that fly or run or jump well with a large and strong thorax. When we look out above

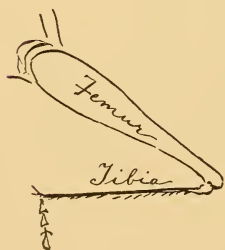
the heads of the grasshoppers to the butterflies sailing in the fragrant air, they seem to be all wings, with no need of anything so earthy as a body; yet when one flits our way and comes to rest on a near thistle-head, we see distinctly that it has a very powerful thorax, by far the largest and heaviest part of its framework.

Now we may as well open our fingers and let our terrified captive leap to freedom, while we lie back and ponder a little on legs in general. These we know, when used for walking or jumping, are always long and firm,—levers, in short, by which the body can be moved along. In order that the creature may take the various positions necessary to a pleasant life, these levers must be jointed. Now legs are legs the world over, whether they belong to a grasshopper, a kangaroo, or a renowned and profound philosopher; and though they may differ in details, those of the grasshopper, for instance, seeming very much out of place on the kangaroo,



and hopelessly ruining the dignity of the philosopher, yet essentially there is no difference. All are levers, all are jointed, and all are worked by muscles, the amount of motion in the leg itself depending of course upon the joints, of which there must be just enough, and not too many, for a successful career in this rather dangerous world.

Leaving abstractions now and returning to the active companion of our summer hour, whose legs are the real object of interest, let us try to discover wherein his great superiority as a jumper lies. First, we shall need to catch the largest one we can find; and as the long legs sprawl and kick we discover that they are fastened to the thorax by a double joint, an arrangement that gives them great freedom of motion at that point, such as we have at our own shoulder and hip joints. Below this very movable joint is the long *femur*, as it is



called, that being also the name of our own thigh bone, the largest and strongest section of the whole leg. Jointed to it is the *tibia*, bearing the same name as our shin bone, and being almost or quite as long as the femur; but in the grasshopper it is exceedingly slender, and often beset with stiff prickles along its

whole length. To the outer end of the tibia is attached the pretty little foot, which is made of several segments loosely jointed together.

It is now only necessary to supply these various sections with strong muscles, that we may understand, at least in a dim way, how the legs work to make the grasshoppers what they are,—the best high jumpers in the insect world.

When we ourselves wish to jump we cannot do so until we have first bent the knees, which we suddenly straighten, making them play the part of a stiff spring. But our jumping is nothing to be particularly proud of; for not even by supplying ourselves with artificial joints in the form of a spring-board can we jump as far in proportion to our size as the lively grasshopper can with his unaided legs. Though his leg, so far as jumping is concerned, is built exactly like ours and is used in the same way, it is much more slender and has relatively stronger muscles. When about to jump, he draws the tibia close to the femur, very much closer than we can possibly draw ours, thus securing force at the moment of release. In the summer meadow it is easy to find one ready to spring. There! suddenly, very suddenly,—for the result depends entirely upon the quickness with which the release is made,—

the leg is straightened and off goes the grasshopper.

It would seem that his jumping is not so mysterious a feat after all, and that we ourselves need only be able to double up our legs a little closer and have stronger muscles in order to emulate him.

Perhaps, however, this is not quite all. In making a good jump the balancing of the body has to be taken into account. We see that the heavy parts of the grasshopper are all



collected together upon the thorax, which is situated, not at one end of the body, but about in the middle. It is not the front legs, up near the head, that are enlarged for jumping, but the hind ones, near the centre of gravity, with the abdomen to balance the head and front part of the thorax.



Now, the frog is a good jumper, and in passing we may as well recall that his leg mechanism is essentially like that of the rest of the world,—only his legs are fastened at the rear of the body, and so he is not a high

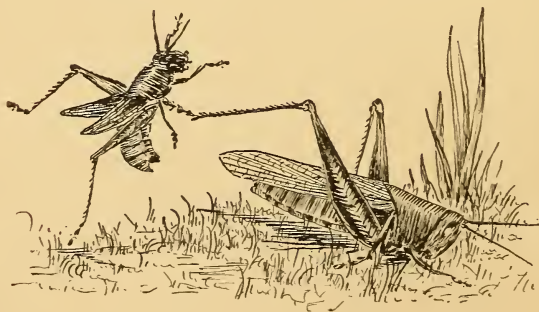
jumper, that is, not as compared with the grasshopper. He is overweighted in front, and if he yielded to ambition and soared high, he might land on the end of his nose. No such danger to the grasshopper, whose abdomen acts as a rudder to steady him in his aërial voyages. So, while we lack the power of using our legs as well as the grasshoppers and frogs use theirs, we are also very poorly balanced for jumping, even as compared with the frog; for when he jumps he has only to thrust his body ahead of him, as it were, while we have to maintain ours in that upright position of which man is so justly proud, but which undoubtedly increases the air friction when he undertakes to jump or run.

However, let us not despond, for if we cannot jump as well as the frog, neither can he invent a balloon, calculate the distance of the sun, nor play football.

Levers well placed are a noble endowment, no doubt; but, as so often happens in the affairs of this humorous world, even the very efficient grasshopper legs are absolutely dependent upon a mere trifle. Have you noticed those two little spines at the end of the tibia? See how they touch the ground as the grasshopper walks. Insignificant as they seem, they make or mar a good jump. At the moment of leaping, the

end of the tibia presses hard on the ground, or whatever surface the grasshopper happens to be resting upon; now, if he should slip, you can readily see that the jump would be a failure; it is also evident that the two sharp prongs growing from the extreme end of each tibia act as braces to prevent slipping. If you have ever happened to see a grasshopper on a very smooth floor, or, better yet, on a horizontal plate of glass, you will not soon forget his ludicrous and futile efforts at hopping. At the moment of the spring the little bracing prongs slip on the smooth surface, and the confusion in the mind of the grasshopper as to what is the matter must be very complete; for Nature never presents her little subjects of the Summertime with any such problem as an extensive slippery surface.

Although the grasshopper does not wish to have his legs slip from under him when he



attempts to jump, he often flings them out without the slightest intention of moving

his own body, but solely for the satisfaction of kicking some other insect; and powerful kickers these long hind legs are, able to send an intruder heels over head in a most convincing manner. The first thing the grasshopper does when disturbed, if he cannot escape, is to let fly his legs violently, but with a certain air of dignity that is most edifying.

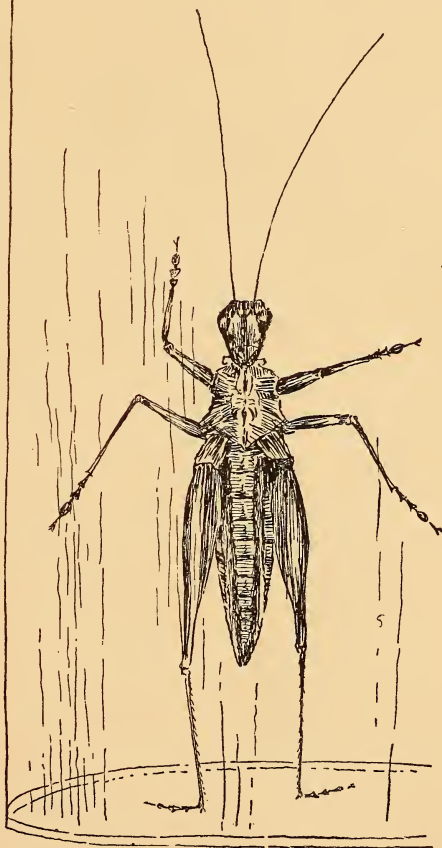
Besides the bracing prongs at the end of each tibia, there are other spines upon it. Indeed, it is a very bristly affair, having a double row of spines up its back; and when we come to inquire what they are for, we have to admit that perhaps we do not know. Certain other insects, as the bees, use the spines and hairs on their legs as combs and brushes with which to keep the body clean, but that is not, at least to any extent, the grasshopper's custom. Possibly if we were to peer at him just before he is hatched, while he is still doubled up in the delicate eggshell, we might find a solution to the puzzle, for he so lies that the backs of his legs press against the eggshell, and when the time for breaking it arrives the prickles, even though not yet very hard, may be of assistance in helping him to break out of his imprisonment.

Then again, may not these little prickles have a psychological significance, so to speak, expressing a certain prickly quality in his

nature which breaks out in his legs, just as there is a power in him to elaborate certain bright colors—an outburst as it were of grasshopper vitality? However this may be, spines the grasshopper has, some species being much richer in them than others. Feet too are his, as one easily sees,—long, narrow, three-or-four-jointed, flexible little things, very prettily finished off with two pairs of hooks. If we can get close enough in our meadow idling, we shall see them planted flat or daintily curled about a grass stem, the sharp hooks, though invisible at such long range, sturdily grasping the tender bark.

But in the foot the treasure that we cannot see is the flat little disk hidden between the toes, as we might call the hooks. It is the same as that in the fly's foot, by means of which the fly can carelessly walk upside down on the ceiling and travel up a pane of glass. Many grasshoppers are not so fortunate as the fly in this respect, their genius expending itself otherwise than on the soles of their feet. If we put one of these in a glass jar, he will try, but try in vain, to climb the perpendicular toboggan-slide. The best he can do is to stand on tiptoe, his long hind legs stretched to their utmost, and his short fore legs pathetically reaching up against the slippery surface.

By far the best way to understand the grasshopper's foot-pad is to call upon a fly ; for, though some grasshoppers are quite able to exhibit foot-pads of an excellency that allows the fortunate possessor to view life from a comfortable upside-down attitude on a smooth ceiling, others are not. Flies, however, always appear with carefully padded feet, otherwise we should be deprived of that familiar if not welcome sight, of ebony experts promenading over our clean window-panes.



We should have to submit the fly to the trying ordeal of having his foot examined under the microscope, if we were bent upon

really seeing his mysterious cushions; but, after all, they would prove to be only little soft, white, rounded disks, their virtue residing in the way they are used rather than in any visible peculiarity. For he has a way of planting them down in so close contact with a smooth surface that the air beneath is quite squeezed out, when he is held in place by the pressure outside.

This same device is used by boys for a less important purpose, they little guessing that their clever trick was the common property of every fly, large or small, black, green, blue, brown, or yellow, long before "suckers" had ever been heard of. Every boy, old or young, knows that a sucker is a circular piece of leather with a string fastened to the

centre. This the boy thoroughly soaks and presses firmly against the pavement, then he invites another boy to take hold of the string and pull it loose. You remember he can't, the air outside holding it down with a grim pressure of fifteen pounds to the square inch. That



seems a terrible weight on so delicate a thing as a fly's foot, but it does not distress him. It is no wonder he can go to sleep with a calm and trustful mind, upside down on a ceiling.

All he has to do is to fit his feet properly and let the air pin him fast. When he wishes to change his place, he can raise one edge of the disk and let in the air; then his foot is free, and it becomes safely attached the moment he sets it down again.

Who can help admiring the unconscious philosopher, troublesome as he is? Even the hairs that fringe his foot-pads, so small as to be invisible to the naked eye, are marvellous things, each one being able to exude a viscid drop, which upon occasion actually glues the foot fast and is strong enough to hold the fly in place, though he can easily pull loose when he so desires.

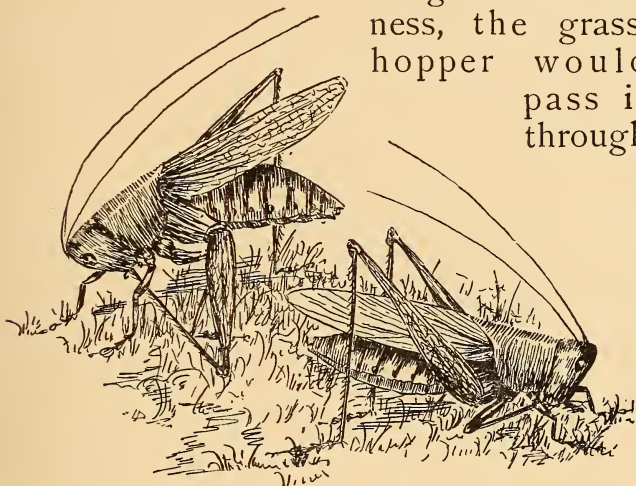
Why should he be supplied with two such different and effective means to the same end? That question who can answer? The truth is, all this matter of the fly's foot-disk, despite much speculation and vigorous assertion, remains just a little misty, for in a case like this it is easier to theorize than to prove. In order truly to explain this slight matter of standing upside down on a pane of glass one would have to be well educated in a number of subjects, including mechanics, chemistry, the laws of attraction and repulsion, the secret of life, universal psychology, — indeed, in all he would need to know on this earth, excepting how to paint pictures and to tell the truth.

Although some grasshoppers are not distinguished for the excellence of their foot-pads, yet others — as, for instance, those small brown ones that hop about the autumn meadows — have not only a good pad between the toes, but similar little cushions on the soles of all the other foot-segments. These can be seen most beautifully as the owner of them walks dejectedly up the sides of a fruit jar in which he has been imprisoned.

No one who has spent a profitable summer day lying under the bushes can doubt that the grasshopper is a first-rate climber, whether he can walk on glass or not. He can go up a weed like a monkey up a rope, and, like the woodpecker, he has faith that out of sight is out of mind, often slipping around to the other side of a stem when he sees some one coming, to save himself the trouble of going farther.

He does not care inordinately about his personal appearance, though he does make an occasional effort to keep his face and hands clean; yet there is a great difference among grasshoppers in this respect, those of some species appearing to be as fond of toilet-making as a fly. Once upon a time a number of very large ones, natives of a European country, having been unfeelingly incarcerated in a glass jar, passed the weary hours in an endless round of toilet-making,

to the delight of their heartless jailer. Slowly drawing up a foot with an expression of great seriousness, the grasshopper would pass it through



his mouth several times, apparently nibbling at it as one often sees a dog nibble at a flea. One after another the feet were thus treated, the funniest part of the performance being the way in which the long hind legs were doubled up and thrust forward within reach of the ministering mouth. These grasshoppers cleaned their faces almost as assiduously as their legs, and one watching them might have imagined they had been taking lessons from a well-bred tabby cat who, first licking her paws, passes them several times over head, neck, and eyes; only, no cat ever attained the expression of solemnity that sat

upon the comely countenance of the grasshopper as it slowly and rhythmically performed the oft-repeated rite, irresistibly suggesting to the beholder that an important act of the universe was now in progress.

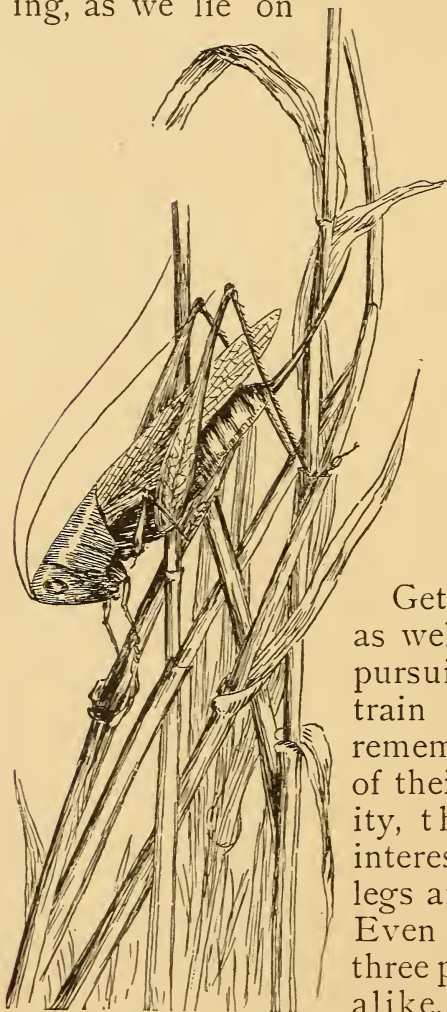
III

CONCERNING THE STRANGE WAYS OF LEGS

DOWN in the old pasture, across the brook where the sweet-flag grows, is a good place to steal away when one wants more grasshopper and less human society for a little while. Here one can lie on his back and smell the sweet-fern while he shakes off the cares of state and reflects upon the graver fact that he is now acquainted with the structure of all the grasshopper's legs; for though the front pair are smaller than the great jumpers, they have the same parts, arranged in exactly the same way. This is also true of the middle pair. Moreover, one now understands the general structure of the legs of all insects, for all are modelled after this one plan.

As to the action of the legs, if we could understand — which nobody does quite — just how they are moved and the force that moves them, we should understand most of the machinery which man has made to do his work, and we should be able to foresee much that is yet to be born from his ever busy brain. Yea, more; it being midsummer

and the old pasture a perfectly safe confidant, we may allow ourselves the luxury of dreaming, as we lie on



the dear earth looking into the sky, that if we could understand those still mysterious grasshopper legs, we should understand a great deal yet unknown concerning the motions of our earth itself, and of the sun, and of the very stars.

Getting back to earth as well as we can, and pursuing a more lowly train of thought, we remember that, in spite of their general similarity, there are many interesting varieties of legs among the insects. Even the grasshopper's three pairs are not quite alike, the front ones

being small, with none of the segments

specially enlarged. They point forward too, and the grasshopper uses them to pull the body, while the long hind legs point backward and push it. The middle legs are larger than the front ones and assist in both pulling and pushing, each pair having its own special work to do.

In most insects — thinking now of the butterflies, beetles, and all the rest — the hind legs are not much, if any, larger than the others, being used simply for walking and clinging. We know why they are modified in the grasshoppers and in their cousins the katydids and crickets, and are prepared for any sort of variation in any of the legs. So we are not surprised when we find the fore legs instead of the hind ones modified in that remarkable relative of the grasshopper, the praying mantis.

No one has lived in the South without seeing many a mantis, or "snake-doctor," as it is more familiarly called, and no one having once seen him could forget the enormous front legs which he thrusts so obtrusively forward. As in the hind legs of the grasshopper, so here, it is the femur and tibia that are specially developed; but no one could imagine for a moment that this bloodthirsty cousin to a grasshopper ever did anything so innocent as hop with these highly specialized legs. Hop indeed! He stands as still

as a stick among the leaves, with his thorax raised and his front legs crooked in a most

sanctimonious manner, an attitude which has given him his name of praying mantis, though he has others much better deserved.



Standing thus, he suddenly grabs at some unsuspecting insect out for its breakfast or on other business bent, and catching the luckless one in the crook of his elbow, shuts it tight, using the leg-spring now for quite another purpose than leaping joyously through the air. From this cruel

trap, which is beset with teeth, the captive

cannot escape, but is quickly consumed by its insatiable captor, whose appetite is in proportion to his equipment for satisfying the cravings of hunger. The leg-springs here have evidently a very decided use.

Yet though these traps are such formidable-looking objects, we see instantly that they are only legs modified by the excessive growth of some of the segments, and as we look at the mantis we cannot help noticing that its whole form has undergone a transformation, as was to be expected. Its thorax is no longer short and thick, for it cannot hop and hates to fly. It is not fond even of walking, though it can get out of the way fast enough when we try to catch it.

In spite of the long and slender thorax,—almost as long as the abdomen,—it is anything but a graceful creature, though one must admit that it has a certain dignity of mien which accords well with its fierce nature.

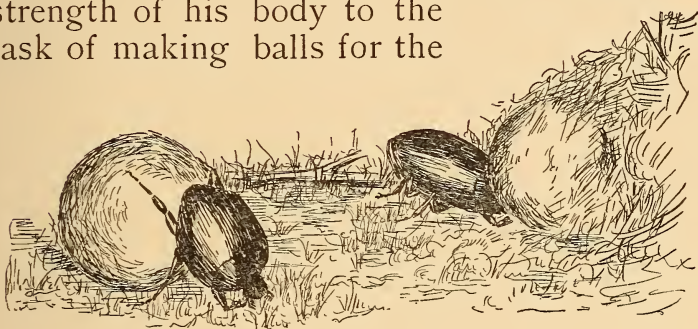
Legs modified to serve some special use are a favorite device throughout the insect world, and there readily come to the mind of every country child, whether he be now eighty or eight, those outlandish black beetles that shared the best swimming holes in the pond with him. Very likely he had some superstition as to certain liberties they would take with his toes, though his fear of

them was probably not strong enough to make him obey orders about going into that swimming hole. And very likely too, his curiosity did not carry him to the point of catching them and discovering that their paddles were in reality legs, though scarcely recognizable as such, being flattened and broadened to an incredible degree to fit them for swimming.

Then there are the tumblebugs that roll balls about the pasture to the endless diversion of those who go to fetch the cows. These coal-black, thick-set ball-rollers that we call tumblebugs, regardless of the fact that they are not bugs at all, have the tibia of the fore legs modified into flat trowels excellent for digging a hole in the ground or patting a ball into shape. But, not satisfied with this, they have carried their fervor for modification to the point of changing their very heads into spades, both head and thorax being flattened and sharpened on the edges into an excellent tool to assist in cutting out the precious ball; and many a boy has forgotten the waiting woodpile in the less strenuous occupation of watching a tumblebug spading away at an obdurate mass of dirt with a complete set of tools that no neighbor had ever tried to borrow.

It would be hardly fair to the tumblebug to leave him without explaining, for the

benefit of those who may not be so fortunate as to have made his acquaintance in early life, that he does not devote his days and the strength of his body to the task of making balls for the



mere sake of doing so, also that he is not always coal black. Tumblebugs there are of a most brilliant metallic purple or green, though our commonest frequenter of the pastures is black. Its reason for making and rolling balls is a very worthy one, the ball being trundled away, sometimes a long distance, to a safe place, where it is buried in the ground or in a rubbish heap and made the receptacle of the egg that is to hatch into next year's tumblebug.

The ball, being large and heavy, is moved in an ingenious manner worthy of a tumblebug, who, standing on his hands with the hind legs firmly grasping the ball, runs backwards, thus pushing it along. Naturally it is the female that attaches the liveliest interest to ball-rolling, though in justice it must

be added that her loyal mate often puts his shoulder to the wheel with most praiseworthy zeal.

Although our tumblebug is a humble enough insect, there is one which has acquired great renown, for the sacred scarab of Egypt, so often found in tombs and now everywhere to be seen in our museums and in the necklaces our girls love to wear, is neither more nor less than the effigy of a tumblebug cut in stone or in gems. To the imaginative Egyptian this little beetle and its ball symbolized the earth and the power that moves it, and so he beautifully immortalized the large and handsome tumblebug whose destiny it was to be born on the banks of the Nile.

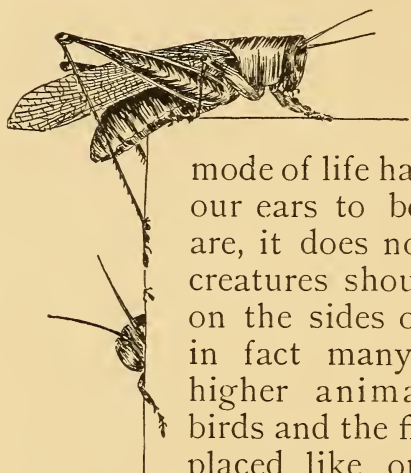
The manner in which the tumblebug is modified to overcome the difficulties of life is exactly opposite to that of the mantis, he appearing at first sight scarcely to possess thorax and abdomen. A more careful examination shows his structure to be that of all insects, only his body is pushed together and solidified, as it were, instead of being lengthened.

That insects' legs should be modified for grasping, digging, modelling, or swimming seems reasonable, but when we find them equipped with ears to hear with, that does seem transcending the prerogatives of legs.

When, however, we ask ourselves in all seriousness just what ears are, the grasshopper's disposition of them ceases to be surprising.

If we look at the outside of the upper part of the tibia on a green meadow grasshopper, we can easily find a small, flat, roundish membrane which has the power of vibrating to sound waves, while back of it is a nerve to conduct the impressions of sound to a very simple but yet adequate nerve-centre, which does duty as a brain. What more than this do our own ears possess that is essential to hearing? For we all know that the outer ear, that projecting shell of cartilage which in the exigencies of life occasionally gets pulled for our admonition or in jest, is not necessary to hearing. It helps to gather the sound waves,— that is all. It is, in short, a sort of natural ear trumpet, which is much better developed in the donkey than in man. Just back of the vibrating membrane, in the insects as well as in ourselves, are structures for reinforcing the sound waves, but the essential parts of any ear are the vibrating membrane (in man called the eardrum), the conducting nerve, and the receiving brain.

Of course, so far as the use of the ear itself is concerned, it does not in the least matter on what part of the body the vibrating membrane is located, so long as it is



sufficiently exposed. Though the structure of our body and our mode of life have made it best for our ears to be just where they are, it does not follow that other creatures should have their ears on the sides of their heads; and in fact many do not. All the higher animals, including the birds and the fishes, have the ears placed like ours, but the lower forms of life find it more convenient to have them on the legs or some other part of the body, — anywhere, it would seem, rather than on the head. Why this is so could be understood in part if one had ten or twenty years to devote to the study of biology, and particularly to that branch of it known as comparative embryology. Of course, at the end of that time we should know much more than why insects hear with their legs, but at present we shall have to be content with the knowledge that it is so. One thing, however, we can see: the head of the insect is small, and is so made that it could not well carry an effective hearing-membrane. Why it has this small head is one of the things we should understand a little better after our twenty years of study. But since it does

have it, the next best thing is for it to dispose of its ears in the most convenient and satisfactory manner elsewhere. For as legs are legs the world over, so ears are ears, no matter on what part of the body they may be found.

Certain of the grasshoppers have the hearing organs on the tibiæ, but others have them on the upper segment of the abdomen instead. Fortunately for them, they do not wear clothes, or their ears would be under their belts. Many insects besides grasshoppers have their ears on their legs. Indeed, this is a favorite way of carrying ears in insectdom. But it must not be supposed that the fore leg alone or the tibia alone is thus distinguished. In some insects the other legs and the other segments share the honor, particularly the femur, and certain beetles are not above wearing their ears on their feet.

Some people deny that insects can hear, but we may be pretty sure that whoever can *make* a noise can *hear* a noise, and there are some very elaborate vocal instruments in the insect world.

Why should this be, if friend and loved one, as well as the musician himself, are deaf to the joyous racket? Is it not an interesting and significant fact that those insects which make no noise have poorly

developed ears, or none at all? No! ears were made for hearing, and this the cricket under the stone knows much better than the sceptical scientist, as he chirps a merry challenge to his ladylove.

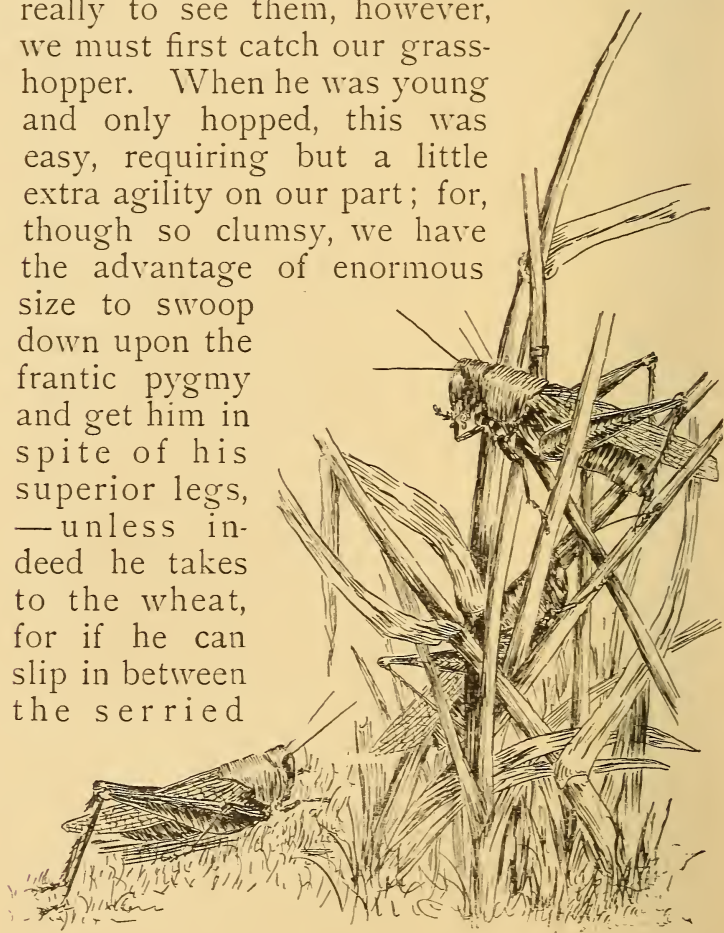
IV

THE GIFT OF WINGS

LYING on a pleasant hilltop in the heat of an August day and lazily watching the active life in the grass and weeds,—for the hotter the sun the more lively some creatures become,—we wake up to a realization that the grasshoppers, not content with sporting about in seven-league boots, have suddenly added the pomp of wings. Where did these wings come from, is a fair question, for certainly the first denizens of the fields had none. One almost never sees a winged grasshopper early in the Summer, and, as one soon discovers, almost never a wingless one late in the season. The reason is simple enough. Young grasshoppers have no wings, and since as a rule the old ones die in the Fall (at least this is true in temperate and cold climates), leaving only unhatched eggs to furnish a never-failing supply for the succeeding season, the year starts with wingless infants.

Whoever has enjoyed watching the legs of the grasshopper is sure to feel a revival of

interest when the wings appear, and in truth these are fully as entertaining. If we mean really to see them, however, we must first catch our grasshopper. When he was young and only hopped, this was easy, requiring but a little extra agility on our part; for, though so clumsy, we have the advantage of enormous size to swoop down upon the frantic pygmy and get him in spite of his superior legs, — unless indeed he takes to the wheat, for if he can slip in between the serried

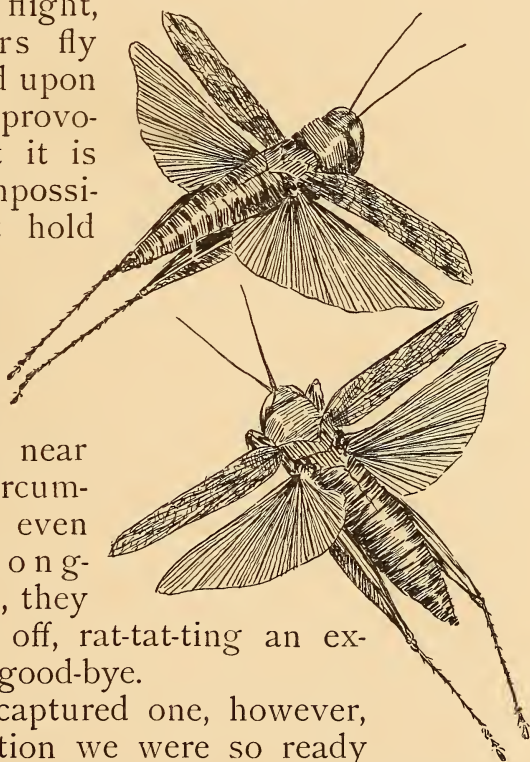


stalks he is safe, as we could not find him even if we dared tread down the grain. When he arrives at the dignity of wings,

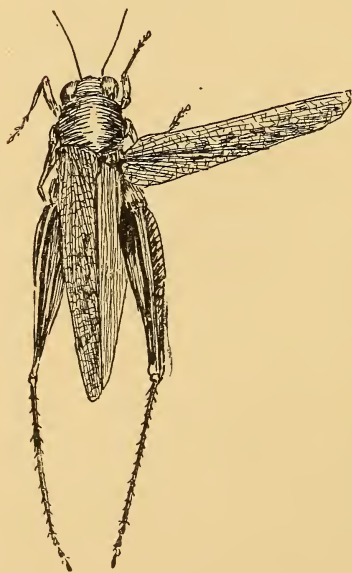
however, catching him is quite another matter, for he sees us coming, gives a derisive kick, or so it looks, and spreading newly acquired wings darts easily and once for all out of reach. Some grasshoppers do not take readily to flight, but others fly swiftly, and upon such slight provocation that it is next to impossible to get hold of them.

They see us from afar, and long before we are near enough to circumvent them, even with a long-handled net, they are up and off, rat-tat-ting an exasperating good-bye.

Having captured one, however, the admiration we were so ready to extend to these newly acquired wings receives a check. We wonder instead how it is possible to do any flying with such narrow, hard, stiff things, that fold down like a peaked roof over the back, in no sense



suggesting the poetry of flight. It is never safe to judge even a grasshopper by appearances, however; so let us, in spite of strenuous kicks and vengeful molasses, gently lift one of these hard wings a little, when we shall see at once that they are not used for flying. There is another pair nicely folded up under them, these outer parts being exactly what they seem — wing covers to protect the delicate wings and the back of the insect. Undoubtedly a good arrangement for rainy days and quiet hours, but what can the grasshopper do with them when he wants to spread true wings and take a turn through the air?



It will do no harm, begging the grasshopper's pardon, to take hold of the tip of one and carefully pull it out sideways. At a certain point we can let go, and it will stay in place of itself, standing out at nearly right angles to the body. Thus, his wing covers

having been opened, the grasshopper does not need to pay any further attention to

them. They lock, as it were, and remain fixed, until by a slight effort he releases them, when they close apparently of their own accord, working like any other well-made spring. Thus he can put all his energy into the sport of flying, for the true wings, cunningly folded up like tiny fans under the hard covers, suddenly spread out to bear him swiftly through the air.

We often see him speeding along as gayly colored as any butterfly, but when this bright denizen of the air touches earth his beauty vanishes as by magic, and all we can find is a dull brown grasshopper that no one who did not know his tricks would suspect of hiding a cloak of crimson and gold under so sober an outside.

Just how the grasshopper works his wings of flight is yet another of those inscrutable trifles that have thus far baffled the mind of man. If we only understood it, we should be able to construct a flying machine that could fly at least as well as a grasshopper, and that would serve us well enough for all purposes but crossing the ocean, for the best fliers can soar both high and far; but, truth to tell, the grasshoppers are not sky dwellers, their affairs being intimately connected with the pleasant earth and its green foliage. Yet though we cannot get at the final mystery of the grasshopper's flight, we know

that it is caused by the rapid motion of the wings against the air, and that this motion is produced by the contraction of certain muscles which have their origin in that serviceable and hard-worked section, the thorax.

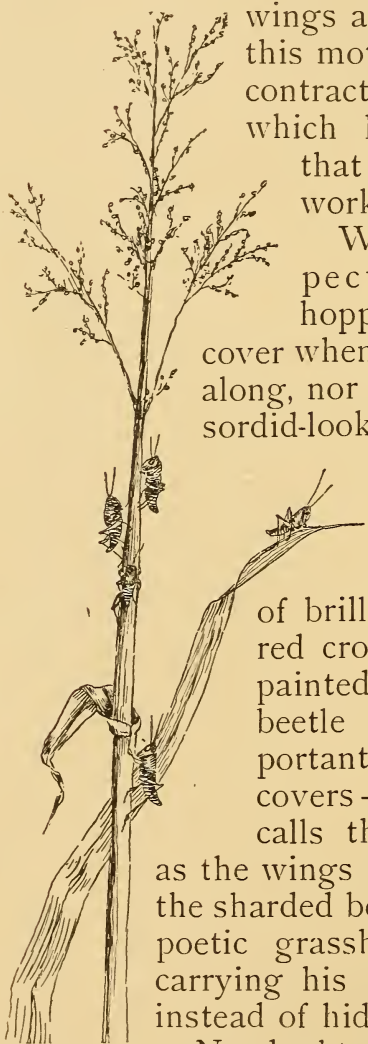
Wing covers are not peculiar to the grasshoppers, as we shall discover when the first beetle comes along, nor are they always such sordid-looking objects. We need

not move from our comfortable place on the hilltop to see, sooner or later, a flash

of brilliant green or purple or red cross our path, as a gayly painted and highly polished beetle hurries along on important business. His wing covers — "shards" the poet calls them — are as brilliant

as the wings of any butterfly, and the sharded beetle outshines the unpoetic grasshopper by virtue of carrying his colors in plain view instead of hiding them away.

No doubt there was a time far, far back, when grasshoppers and beetles and



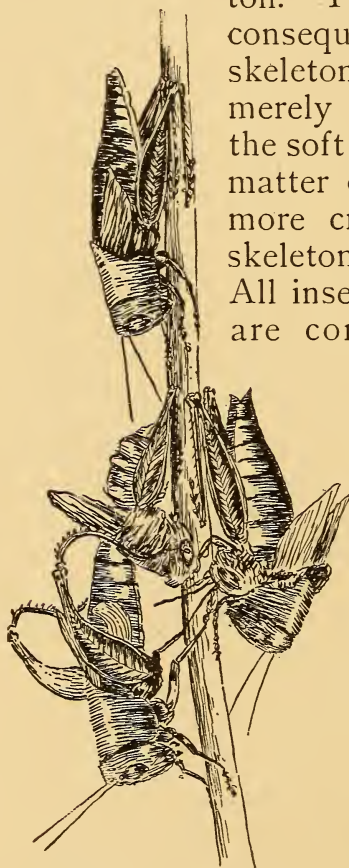
all other bearers of wing covers had four flying wings, but as time passed the upper pair for some reason ceased to serve, then hardened and stiffened until they became what we see them, mere protectors, or at best, sails to set against the wind.

Still farther back the insects had no wings at all, and this is still the case with the grasshopper for the greater part of his life. His wings come to him gradually, as wings came gradually to his race. He hatches from the tiny egg as a grasshopper, recognizable by anybody, but quite wingless and very babyish in appearance. If we wish to see him at this time, we shall have to go about it very early in the Summer, the best way being to dig out a nestful of unhatched eggs. He appears upon the stage of life tiny, pale, scarcely able to stand, for his legs, though six, are excessively wobbly, and he rolls and twists about in a comical manner. His appetite is not uncertain, however, and he soon acquires strength to stand up very straight on his young legs, while the sun browns him and time transforms him into a most uncommonly pert-looking infant.

Being born hungry, he eats heartily of the delicacies always within reach and grows apace, until he suddenly finds himself too big for his skin; for growing subjects him to an inconvenience about which we know

nothing. Our skin grows with our body; his does not. In short, his skin is his skeleton. That it is outside is of no consequence, since the use of a skeleton, wherever it may be, is merely to support and protect the soft parts of the body; as a matter of fact, there are many more creatures with outside skeletons than with inside ones. All insects have them, and they are composed, not of bone,

but of horny chitin, a substance so indestructible that even fire will not burn it. It is this that makes the insects so hard and stiff, gives rigidity to the strong legs of the grasshopper, and binds the tender body of the young insect in a horny swaddling cloth in which it can do no more growing.

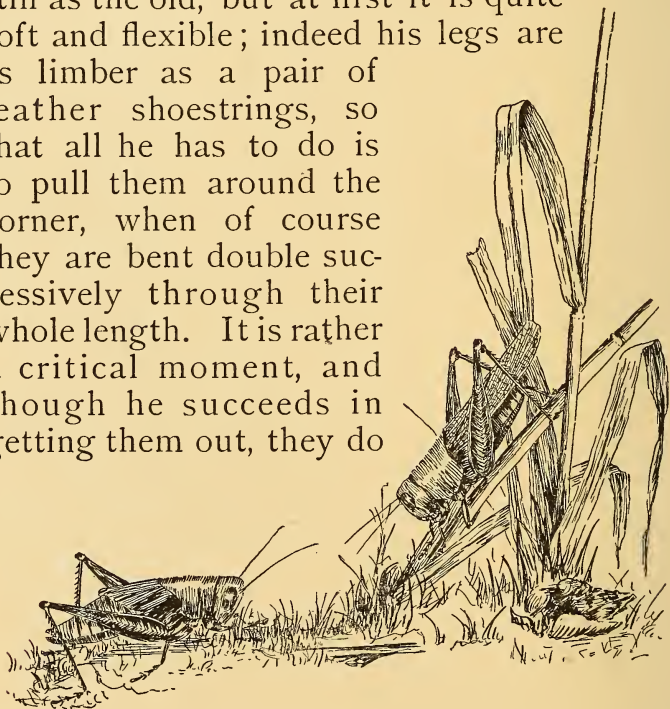


What is to be done? The uncomfortable prisoner looks as though he were recalling his past gluttony with sadness and remorse, as he stands quite still with legs drawn up on the grass blade, which has lost all flavor

for him. In the throes of anguish he firmly clutches the grass stalk with his hind toes, and then, woful sight! his too tight skin begins to split down the back, and through the opening presses out the soft pale body. At the same time his form is rent with spasmodic movements. But these painful struggles are not the throes of death, for presently he draws his head entirely out of its skin, which remains as a stiff and transparent mask, eyes, antennæ, and all. He can now look clear-eyed on a pleasant world once more; but his troubles are by no means over, for it is very evident by this time that he is actually taking off his skin. More spasmodic contractions of the imprisoned muscles, and he pulls out his fore feet, leaving their old skin dangling like a pair of cast-off gloves. It is fortunate that at the beginning of trouble he clutched fast with his hind toes, for now they are his only support as he struggles loose, pulling with his newly emerged fore feet; and these quickly harden, although when first drawn out they were soft and helpless. Finally, after much contracting of muscles he pulls himself through the rent in the back of his old skin, which as it loosens he works beneath him, finally shedding it like a pair of overalls.

There is only one thing for the sympathetic

beholder to worry over,—how can he withdraw his hind legs, doubled up as they are at a sharp angle as though ready to hop? He could not do it if the new skin were as stiff as the old, but at first it is quite soft and flexible; indeed his legs are as limber as a pair of leather shoestrings, so that all he has to do is to pull them around the corner, when of course they are bent double successively through their whole length. It is rather a critical moment, and though he succeeds in getting them out, they do

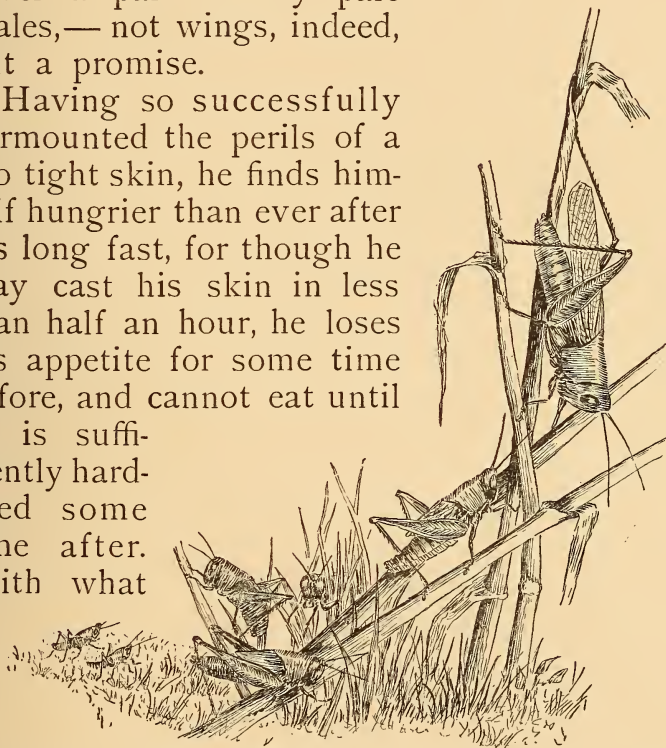


show signs of hard treatment, being curved in a distressing manner that makes the newly emerged creature look hopelessly bow-legged. However, they straighten out as the new skin hardens. Very soft now, but considerably enlarged, the debutant clings weakly to his cast-off skin, which has shrivelled up until

the wonder is that it ever fitted him. In a few hours he will be moving joyfully about as hard as ever — and a size larger.

If now we look for wings, we may discover a pair of tiny pale scales,— not wings, indeed, but a promise.

Having so successfully surmounted the perils of a too tight skin, he finds himself hungrier than ever after his long fast, for though he may cast his skin in less than half an hour, he loses his appetite for some time before, and cannot eat until he is sufficiently hardened some time after. With what



eagerness the starveling now falls upon the good things within reach! Regardless of consequences he gormandizes more than ever, and in the course of a few days finds himself in the old predicament — skin altogether too tight. There is only the one remedy,

and presently he reappears upon the scene looking as fresh as though he had just been painted,—a size larger, and carrying a little pad on each side of his back instead of the two formless scales.

Thus he passes through the perils of youth until he arrives at the fourth or fifth moult, which is also the last and most difficult change of skin. He is now a well grown, strong-bodied stripling, able to hop high and far, but not yet able to fly, for though his back is adorned by what appears to be a pair of little wings, they are as yet quite useless.

Wings are the crown of his days, and not until the last moult, when he has attained his full size and all his powers, do the wings free themselves from their enveloping membranes.

As the old skin is pushed off for the last time, the wings—still small, limp, and damp—drop out. Quickly the air and fluids rush through the freed channels, the wing covers taking shape and consistency, the under wings lengthening and widening, as though a flower were opening its delicate petals. They hang thus free until sun and air have dried and hardened them, when they are folded up and tucked away under the now ready wing covers. The earth-bound grasshopper has blossomed into that glorious thing, a winged creature.

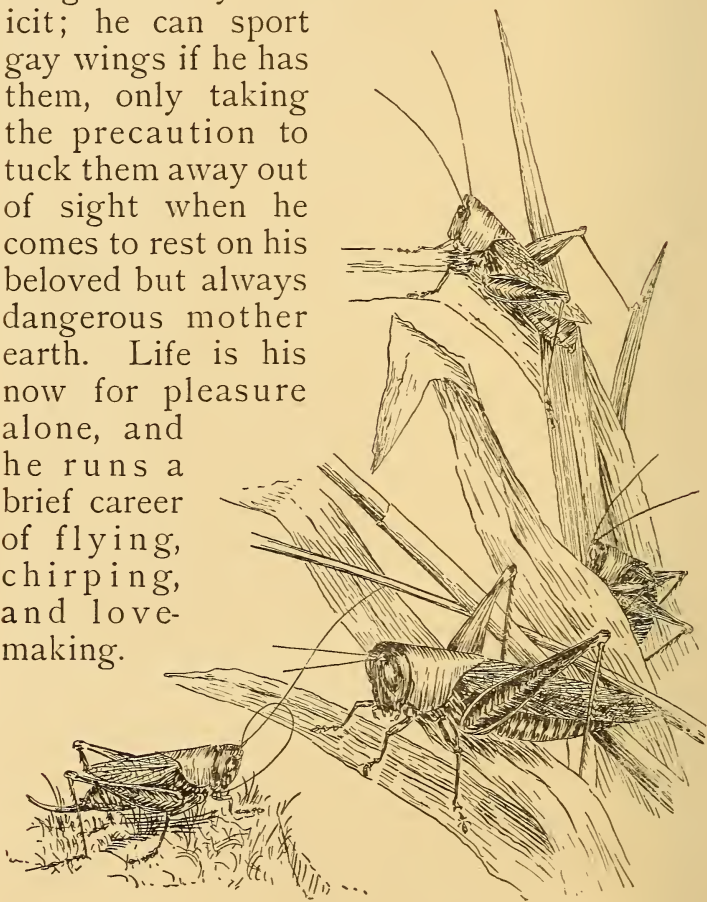
V

SONG AND REVELRY

WHEN the dusty air quivers in the fierce heat of midsummer, when the meadows parch and turn brown, and the most energetic of humankind gladly lapses into a summer idler, then the grasshoppers are in the very heyday of life and action. They chirp, they dart on whirring wings, or make sharp, snapping noises as they speed along. Then painted fans are everywhere challenging the gorgeous sails of the butterflies, as though when the mad hour of flight came, the humdrum world with its sober colors had a right to be forgotten in intoxicating voyages through the sun-drenched air.

Wings announce the holiday time of the grasshoppers, appearing as they do when the great pressure of eating for a living is about over. The grasshopper must grow, and grow fast, to complete his little cycle of life in the one short season that is his, and to do this he must eat industriously, and with a single mind, until he has reached his maturity.

Then for a brief season life is his for pleasure. His bank account is sure, with no danger of any deficit; he can sport gay wings if he has them, only taking the precaution to tuck them away out of sight when he comes to rest on his beloved but always dangerous mother earth. Life is his now for pleasure alone, and he runs a brief career of flying, chirping, and love-making.



Not that he has stopped eating altogether, — the habit is too firmly established and the need is not quite all gone; for though he

has no longer to expend energy in growing, he has still to supply fuel for the varied activities that yet remain

to him. The chief of these is finding his mate, and upon this important and happy task he now lavishes all the graces of his grasshopper nature. It is for this he cheerily chirps, for the young grasshopper has not that strident gift; and thus it is the latter part of the Summer that so resounds with the tumult of grasshoppers, katydids, and crickets.

These sounds, which fill the meadows and vibrate through the night, are one and all love calls; and this knowledge

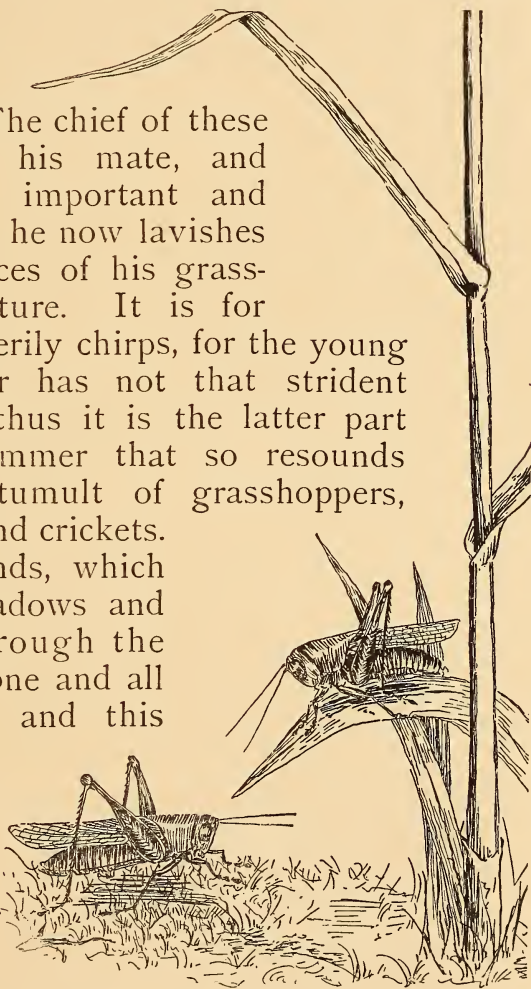
may perhaps give

them a pleasanter

note to our sometimes

wearied but always sympathetic ear.

The grasshopper is doubly blessed when



he gets his wings, since they bestow not only that most enviable of all endowments, the power of flight, but that sister gift of the gods, the power of song.

The song of the grasshopper, though too simple to excite envy in many breasts, is yet sufficient to express the happiness of an overflowing heart; and such as it is, it comes entirely from the wings, the modest wing covers here taking an important part, sometimes being played upon violin-wise by legs, strung for the purpose.

Legs and wings, inexhaustible treasures, produce the tireless chirping of our summer meadows. The long hind legs, disdaining to act as mere organs of locomotion in this gay season, in some species assume also the part of musical instruments shrilly effective if not oversweet of tone; and the summer idler, oppressed by the heat of noonday, can charm away an hour by catching a common brown hopper and looking at the inside of the femur with a tolerably strong magnifying glass. What he will see, if successful, is a number of very fine ridges which are used to set the adjacent wing cover into vibration.

Out in the meadows, where the grasshoppers are making the best of the fair days of courtship, the attentive Rambler will many a time catch the ecstatic fiddler in the very act. Holding himself down to earth with

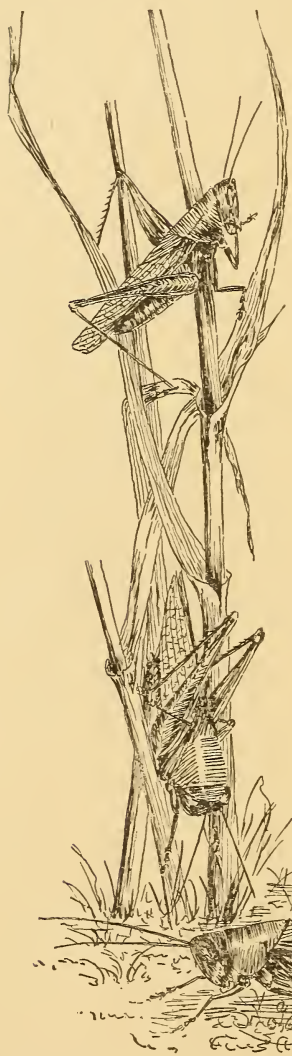
his other feet, he draws femur and tibia of the hind legs as close together as he can get them, and jigs them rapidly up and down. Then through the willing air comes trilling his feeble song of the Summer, for the note of these fiddlers is not very loud, being that far-away sounding chirp we so often hear when lying on the grass, doubtless the sound to which Homer likened the voices of old men done with fighting, and who

“ In summer days like grasshoppers rejoice,
A bloodless race, that send a feeble voice.”

Not all grasshoppers have so feeble a voice, however, some of them shrilling out until they can be heard a quarter of a mile away; for the grasshopper tribe is a large one, comprising not only the grasshoppers proper, but the crickets, and between these, numerous strange forms that seem to belong equally to both sides,—grasshoppers that are half cricket, crickets that one can hardly tell from grasshoppers.

When we glance over the earth, we find the grasshopper family represented almost everywhere, and in a state of confusion as to who is who. So, while grasshoppers of one division scrape their legs against their wing covers to produce the solacing sounds they so love to make, others discard the help of the legs altogether. They slightly raise the wing

covers, and then by muscular action rub the



upper parts of the wings against the upper parts of the wing covers which are modified for the purpose, and thus set into violent vibration, accomplishing beautiful results of shrill ecstasy. Again, certain species set their wing covers into vibration during flight, making the rat-tat-ting sound so familiar and so exasperating to those who have tried in vain to capture the minstrels; for to these rat-tatters belong the very best fliers, and it is also these that poise on speaking wings above their ladylove as she sits watchful in the grass.

Although the musicians perform on such simple instruments, it must not

be taken for granted that they express no

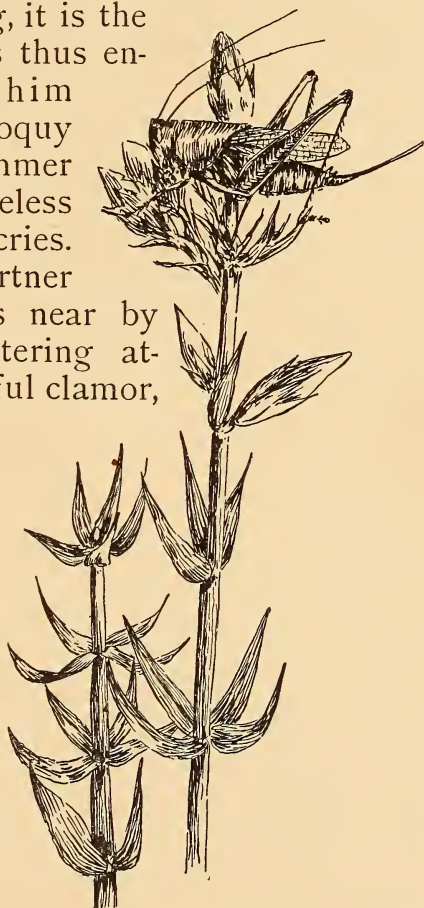
individuality. On the contrary, one can very quickly learn to distinguish the different species by their voices, and more than this, the different individuals. For, after all, what is voice, in ourselves or in the grasshopper, but air vibrations of different rapidities striking against the sensitive curtains of the ears? We voice our sentiments in tones of varying pitch, so do the grasshoppers; we space our sets of vibrations in a variety of ways, so do they. Only they lack that wonderful instrument that we have in our vocal chords and accessory organs. What they say is very simple and comparatively monotonous, yet it is pleasant to think that when grasshopper John chirps to grasshopper Eliza he does it with his own unmistakable, individual grasshopper John chirp, which grasshopper Jim could no more imitate than we could imitate the voice of our next-door neighbor. He may say the same thing, but he says it in his own voice, which makes all the difference. It is probable that what grasshopper John says is very simple indeed; it may be only this, "Where are you, my dear, where are you?" and then, "I love you, I love you." But I leave it to any one if that is not enough. Undoubtedly to grasshopper Eliza this cry of grasshopper John is thrillingly sweet, and very likely puts her more in unison with those upper-sky spaces into which

her new wings occasionally bear her. But if grasshopper John's voice is simple, grasshopper Eliza's is yet simpler, for she has none at all. She can only thrill in silence to his ecstatic love-chirps. Her wings are well grown and can bear her above the meadows of her childhood, but they are only for flying, and she can sing no song with them, it being reserved for her more fortunate lover to combine the ecstasy of flight with that of song.

Nor is the grasshopper, because of his simple nature, barred from the enchantments of a complex courtship. It seems to be the nature of Eliza from the monad to man to require strenuous effort as the price of her favors. Grasshopper Eliza sits silent on her blade of grass and watches with apparent indifference the advances of her lover. Sometimes grasshopper John runs coquettishly up and touches her lightly with his antenna, then suddenly retires as though fearing some dire punishment to follow so bold a deed. Again he poises in the air on clattering wings immediately above her, as though hoping to catch an approving glance from her beaming eye. But she is not yet ready, and coyly repulses his advances, or, more cruelly yet, ignores them. Thus pass the warm summer days, until cruel Eliza relents and is kind to little grasshopper John.

Throughout the whole grasshopper world, among crickets, katydids, and all that have the power of song, it is the male alone who is thus endowed. Upon him rests the whole obloquy of filling the summer nights with ceaseless and ear-piercing cries. Does his silent partner among the leaves near by listen with unfaltering attention to the joyful clamor, or does she, like ourselves, occasionally long for a respite, or even sleep through the deafening chorus that swells in her honor?

Doubtless it is claiming too much to say that the chirping of the grasshoppers and crickets is only the cry of love. Doubtless they too feel the joy of life, the mere rapture of existence that makes boys whistle and lambs frisk. The cricket on the hearth in midwinter can have



no rational hope of luring his love out of the near-by snowbanks, yet he chirps away as shrilly as ever he did in the sweet and cricket-filled summertime.

Notwithstanding occasional bright wings shaken out at the moment of flight, even the riotous August grasshoppers are a sober folk so far as their garb is concerned; yet these quiet colors, though they may not charm our eye, invest the wearers with a certain pleasing interest, for to the grasshopper as to the rest of us life is sweet, and an inconspicuous dress helps him to preserve it.

If we happen to be loitering the summer days away at the seashore, we shall often be confronted by pale gray grasshoppers the color of the sand, and looking as though dusted over with it. These are not dusty, however, but by some inner force of selection have clothed themselves in the garb most truly protective; unless they move, you will hardly notice them. Next to the gift of life itself among the small defenceless creatures is the power to save that life from devouring foes. Since one of the best protections is to be inconspicuous, among all small or weak creatures we find their covering, whether it be of fur, feathers, or painted skin, colored like their surroundings. The green-mottled frog sitting at

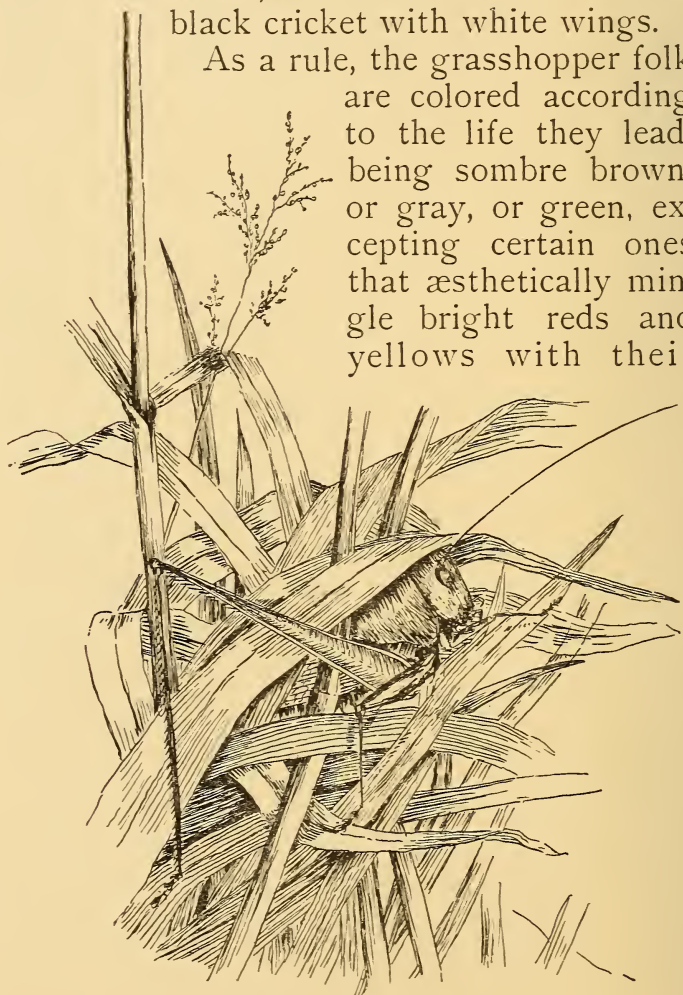
home feels safe in his skin, so inconspicuous by the brookside, however it may seem when we rudely snatch him away and place him in surroundings that are not colored brookwise.

Certain animals, as every one knows, even change their color to suit a changing environment, as, for instance, the arctic hare, which, snow white in winter, becomes brown in summer; and, going a step farther, there are little lizards that take the color of whatever they happen to rest upon. How animals control their coloring is another of those simple mysteries inscrutable to the lord of creation, who can measure the distance of a star but cannot explain that faculty in a grasshopper which enables it to produce a pale skin for residence in the sand banks, and a black one for occupation on black soil.

Since many grasshoppers live by preference on the ground near the roots of the grass stalks, they are well protected by being colored brown or brown-and-green, while others choose green relieved by touches of yellow and red for their costume; and the katydids, preferring to hide among the leaves in the tree tops, are invariably green. Crickets, on the other hand, choosing to hide away in dark places, under stones and in the crevices of rocks, are found clad in funereal

black. However, in Austria there is a fine black cricket with white wings.

As a rule, the grasshopper folk are colored according to the life they lead, being sombre brown, or gray, or green, excepting certain ones that æsthetically mingle bright reds and yellows with their



greens and browns, as though conscious that the grasses, and the sunlight playing over all,

yielded also those colors. Why the under wings are bright is another of those apparently simple but really unanswerable questions that are always confronting us in the world of nature.

We are learnedly told that the wings of all male creatures, whether insects or birds, have become beautiful through a long process of selection, bright colors insuring success in courtship, even the proud tail of the peacock offering no difficulties to these theorists. But this lucid explanation fails to enlighten us as to how the very first peacock tail came to be full of bright eyes, or how the very first pair of royal purple grasshopper wings got their dye.

We can imagine that a peacock of exceptional beauty might vanquish his rivals for the favor of a very discriminating ladylove, and that his descendants, inheriting his charms, might also bear away the matrimonial prize, until the whole race finally inherited the glowing ornaments of the successful suitors; but *that first peacock*, — who can account for him?

May it be that his beauty came as an expression of superabundant vitality, which thus overflowed in bright colors instead of in horns or outrageous protuberances? that he was so full of harmonious life force that he blossomed into beauty, as other birds,

expending their superabundant force in another channel, burst into song?

His mate overflowing less with vitality and able to subdue her plumage to the necessities of the family life, the double selection goes on, the handsomest male giving the instinct for beauty to his sons, and the mother best protected for her long period of brooding handing on through inheritance to her daughters the priceless gift of quiet coloring.

VI

WONDERFUL POSSESSIONS

RECLINING on a dry and mossy bank near a tangle of sun-warmed weeds where the grasshoppers are stirring about their various pursuits, the summer idler will presently fall to wondering what power guides their actions. He discerns a simple intelligence in them that seems akin to the workings of his own mind.

Has this grasshopper, then, a brain? Has it a nervous system folded somewhere in the eager body? If so, is it like our own, differing only in degree? Or does it differ also in quality?

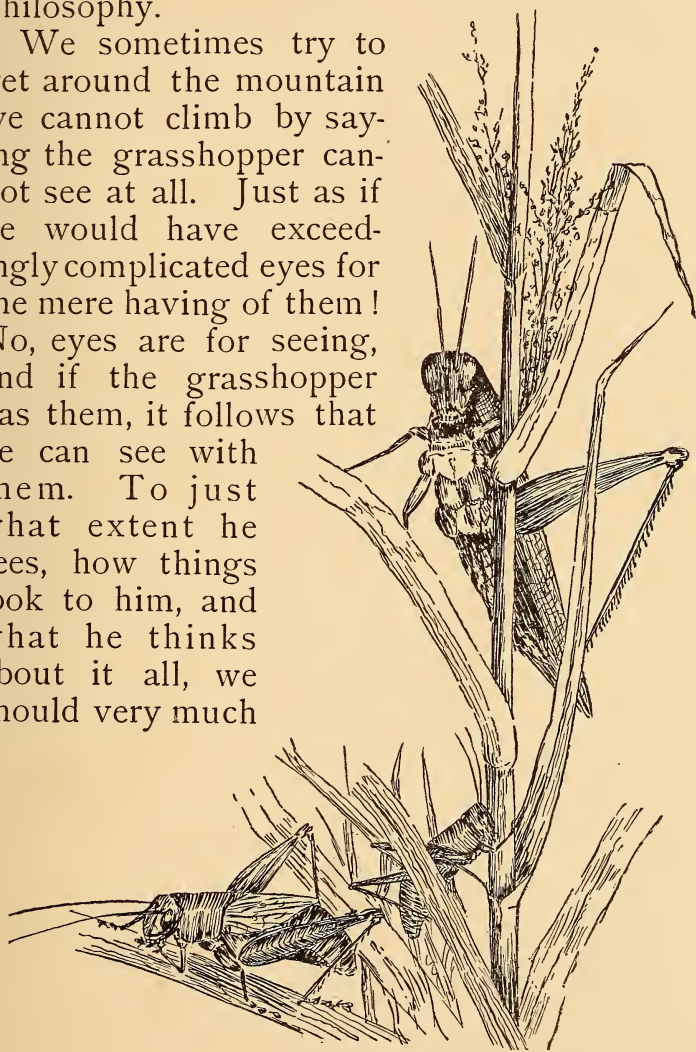
Summer dreaming and superficial looking will not bring the answer to these questions; it is necessary to turn to the student of nature, who spends his days seeking to lift one by one the veils that shroud so much of this wonderful earth life. He tells us that the insect has indeed a nervous system, that most inscrutable of all mysteries, as inscrutable in a grasshopper as in a man, and essentially the same; for though the brain of

a grasshopper cannot plan an ocean steamer or compose a poem, yet it is a true brain, able to guide its possessor through a life which, though so simple, is yet full of perils.

As one would expect, the nervous system of these careless visitants of a Summer differs from our own in many ways; it has, for instance, a series of little brains along its central axis from head to tail, the largest and most complex of these being found in the head. This is a most convenient arrangement for a creature bearing its ears on its legs, for the nerve of hearing, instead of winding its way to the head-brain, is able to make a much shorter connection with one of the other brains located nearer the ear. The eye, on the other hand, is closely associated with the head-brain, as is fitting for so complex a structure. The grasshopper looks knowingly at us out of eyes so wonderfully made as to fill us with amazement, and the fact that they are differently formed from ours need not lead us to disparage his seeing-power. For, after all, what is an eye? Merely an instrument to gather up light vibrations, a nerve to pass them back, and a sensitive brain to receive them. All these the grasshopper has, only his eyes are very puzzling to us because they are so complex. His brain may be simpler than ours, but be it known our eyes are much simpler than his, and just how he

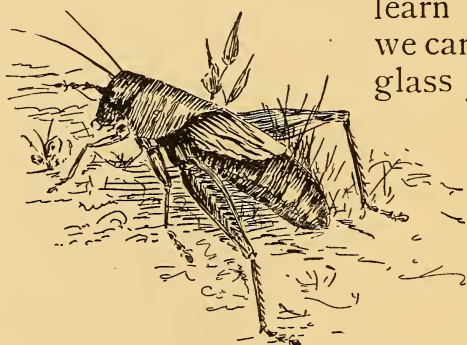
uses an eye made up of a group of many small eyes is too much for our single-eyed philosophy.

We sometimes try to get around the mountain we cannot climb by saying the grasshopper cannot see at all. Just as if he would have exceedingly complicated eyes for the mere having of them! No, eyes are for seeing, and if the grasshopper has them, it follows that he can see with them. To just what extent he sees, how things look to him, and what he thinks about it all, we should very much



like to know. We should like to know, too, whether he is as wise as he appears, and whether he really has discovered life from the grasshopper point of view to be one vast and splendid joke. He certainly gives that impression as he sits contemplatively on a blade of grass.

That there is a quick and sympathetic communication between eye and brain we



learn to our cost if we carelessly open the glass jar in which for purposes of our own we wish to detain a reluctant member of the active tribe.

In a moment the door to freedom is discovered, and, by some related working of eyes and brain which appears to be the same as that in ourselves under similar circumstances, the alert captive suddenly puts all his best jumping into play and away he goes, giving us a pretty chase to capture him again.

Although the insects carry their ears anywhere but on their heads, their eyes, as we well know, are found where we are accustomed to think of eyes; but besides possessing two large ones with which to contemplate a puz-

zling world, the grasshopper sometimes has the top of his head ornamented with three small simple eyes, which seem to be of no present use and are often lacking. In some insects, as the bees, they are always present, and may be helpful in poking about the narrow corridors of a dark hive.

But whether they are useful to the owners or not, these three eyes are very interesting to us, for at least traces of them are found in nearly all insects; which shows that, whatever they are to-day, they were once important, probably being the only eyes the creature had. Now they survive as mere signs of heraldry, establishing the pedigree of the insect and carrying it straight back, not to Norman conqueror or Roman emperor, but to that far-back ancestor of all of us, the worm. Insects are undoubtedly developed from worms, though not from any worm now on earth, and it would be very unfair as well as discourteous to call them such.

It makes us feel our limitations to be obliged to confess we cannot understand the eyes of a grasshopper, but that is only a beginning of our helplessness in the face of this very mysterious insect. If the eyes bother our superior intelligence, what are we to do about the antennæ, those marvellous threads that grace the front of every grasshopper and bestow upon him powers of

which we ourselves would not need to be ashamed? For one thing, there is no doubt that he smells by means of his antennæ, and smells with a niceness and to an extent scarcely dreamed of by us; for though our power of smell is by far the keenest of our senses, it is crude enough compared with that of most insects. It has been demonstrated that we can detect by our coarser sense of smell the presence of $\frac{1}{2760000000}$ of a grain of mercaptan, a very malodorous and penetrating substance. Imagine it if you can, our noses able to detect something so small that the microscope would have hard work to find it; and then reflect that the humble insect with his superior sense of smell would find this a very elementary performance.

No doubt the sense of smell was originally developed to enable animals to smell out their food, to find their friends, and to detect their enemies. Man has found other ways of meeting these needs, so his sense of smell is on the wane, though it still continues to be, as just said, the most acute faculty that he has. The insects, on the other hand, have never ceased to depend upon their power of smell to guide them aright, and in many cases they rely upon it to the exclusion of both sight and hearing, some insects having enormously developed antennæ.

Recalling the general history of eyes and

ears, one naturally and truly surmises that the organ of smell is in all creatures fundamentally the same,—a surface sensitive to odors, a nerve to carry the impression, and a brain to receive it.

With ourselves the sensitive surface is at the upper end and inside the nose, and that prominent feature, of whose sometimes classic form we are so



proud or so envious as the case may be, is after all nothing but a shed to cover the exceedingly sensitive membrane within,—a fact which may console those whose noses are hopelessly *retroussé*. But though we have our nose in the middle of our face we could not be so unreasonable as to expect all creatures to do the same. Among the higher animals this happens to be convenient, but among the insects the olfactory

organs are not on the face at all, but on the long antennæ or feelers that grow out from the front of it.

We can imagine the insects depending so much upon the sense of smell that an ordinary nose could not at all supply their needs; a smelling organ of extreme delicacy, capable of being waved about in the air, being much more able to intercept the subtle odors upon the detection of which may depend the creature's very life, — odors so subtle that we with all our pride of brain could not even know they existed.

Although the grasshopper's feelers were not designed as mere ornaments, yet like our noses, they add immensely to the personal appearance of the family; and it could easily be imagined that vanity dictated the graceful way in which they are waved about, if one did not know the very practical nature of those delicate appendages. If we study one under the microscope for a while, we shall discover the secret of its wonderful flexibility. It is not a solid rod, but a great many tiny sections, connected by movable joints. This makes it as limber as a willow switch, while it has a power possessed by no switch, for it can move itself, being supplied, tiny as it is, with yet more tiny muscles and nerves.

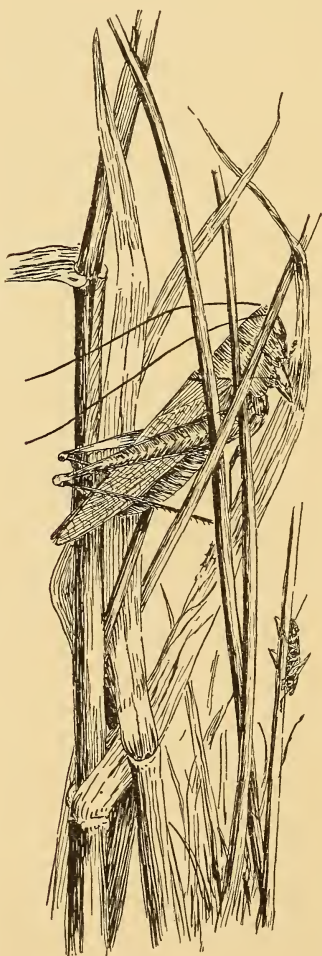
But this is not all that the microscope is able to tell us about it. Each tiny segment,

excepting the ones nearest the head, is supplied with minute pits or hollows, each containing a yet more minute hair or bristle. A nerve running from each pit into the large trunk of the main olfactory nerve connects with the brain. Sometimes there are as many as fifty of these pits on each minute segment of a grasshopper's antenna, and they with their accessory parts are the organs of smell, than which there is nothing more wonderful on earth, excepting the workings of the mind itself.

Although the grasshopper can undoubtedly see with its eyes, yet it does not trust them to decide so nice a matter as whether a thing is good to eat. The antennæ must do that. How quickly the fastidious creature shrinks back if these mentors touch a disagreeable object! Danger lurks where the smell is not right. And how carefully each bit of food must be examined by the quivering threads before it can be tasted!

Even the cockroach is a fastidious and dainty feeder, although we might differ with him in the choice of a menu. He has feelers of a length and delicacy to grace a nobler front, and he handles them in a pretty fashion that well becomes a near relative of the grasshoppers, which he is in spite of his looks. He has a way of poking about other people's pantries after dark, and for

this discreditable business he needs the longest and most sensitive of antennæ.



The advantage of antennæ over eyes is that the possessor can live in the dark, if he must, and yet be able to explore the universe. No doubt life is sweet even in the caverns of the earth, where knowledge is principally conveyed through the antennæ, these valuable organs being exceedingly sensitive to touch as well as to smell. The extent of their power who can know! They decide, it may be, texture, surface, temperature, and even color, as certain curiously gifted human beings are said to do, by touch alone.

The observant summer idler knows that grasshoppers differ very much in the style of their antennæ, it being the universal fashion among a certain class which are slender and

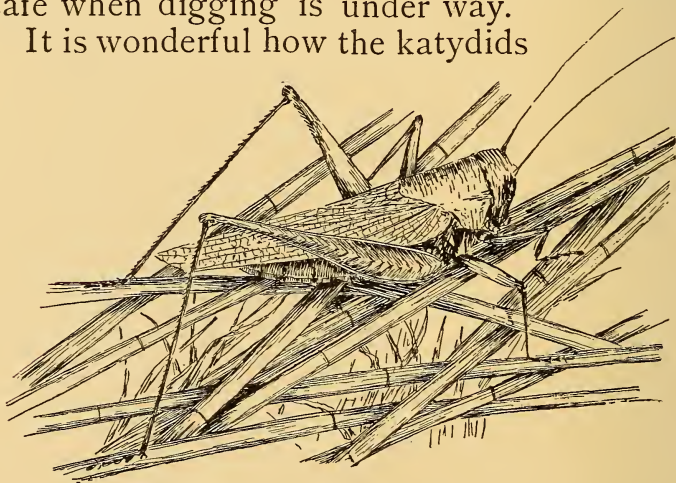
rather elegantly proportioned to bear antennæ to match, although they do not banish themselves to the nether regions in consequence. These we call long-horned grasshoppers, heedless of the fact that their long and graceful threads do not bear the slightest resemblance to horns. Others, again, being of a sturdy and homespun make, have comparatively short and thick-set feelers, which better justify us in calling them short-horned grasshoppers.

The fly, which is always with us, has fortunately exceedingly short antennæ. Imagine him fitted with a pair like those of the katydid when at an early hour he comes to promenade across our pillowed cheek! He has them short and thickened at the end, to afford room for the olfactory spots, evidently not finding it necessary to his peace of mind to put them in actual contact with the objects he wishes to test. Indeed, mere length of antennæ is not the final test of usefulness, some insects having them very short as well as very effective, though there must always be sufficient room on their parts to support the indispensable olfactory spots.

When we look at the tumblebug, we might be excused for thinking he had none at all, since when disturbed he tucks them flat under his head. Digging in the earth with a head shaped like a spade is not consistent with

long antennæ, yet the tumblebug needs good smellers to enable him to find just the right material for his precious ball. Consequently his organs have been modified to the last degree, the tiny segments enlarged and flattened into plates that lie close together and can be flattened and folded to fit into a little hollow under his head, where they are quite safe when digging is under way.

It is wonderful how the katyids



and some others of the grasshopper kind are able to pass through the vicissitudes of life out in the trees and bushes with such long and slender organs. These must be a great responsibility, one would think, always in danger of being broken or pulled off. Yet one seldom meets the victim of such a misfortune.

If for any reason, however, the insect does

lose his antennæ, he might, in many cases, as well lose his life. Ants sometimes bite off each other's feelers when fighting; and the one thus crippled no longer fights, or eats, or does anything but mope about until death relieves him.

Deprived of his sense of smell, the insect no longer recognizes food or friend, or detects the presence of an enemy. He is a soldier in the thick of battle without armor or weapon of any sort, and soon disappears from the scene of action.

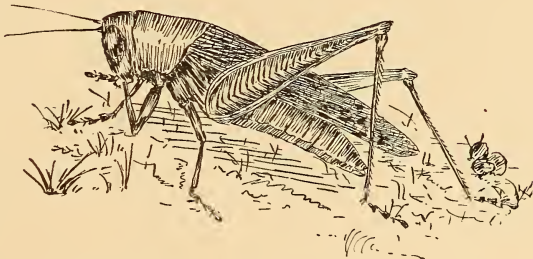
VII

MOLASSES AND OTHER IMPORTANT MATTERS

WHOEVER has trifled with the grasshoppers, either in the careless hours of youth or at some later if not wiser season of outdoor idling, recalls the copious "molasses" with which his fingers were promptly smeared.

He recalls also the little rabbit-like mouth with its "whiskers" always in motion, now nibbling grass blades, now spitting molasses on disturbing fingers,—a strange little mouth that opens the wrong way and has no teeth, the hard and horny jaws being notched or toothed on the edges, which is the better way for cutting up leaves. For our jaws to be placed on edge between nose and chin so as to open and shut from right to left would produce a result fit only for a nightmare, but for the insect such an arrangement is useful and not in the least unbecoming. As for the rest, this absurd and diminutive mouth is moved by muscles as carefully made and attached as any that we possess.

Who has not watched a grasshopper nibbling a leaf? How fast the eager mouth travels along the edge, leaving an empty space or a ragged scallop to mark its destructive course! It is astonishing how much one little growing mite can devour in the course of a day. The word "growing" explains it, however; the leaf is only so much fuel cast into a consuming furnace, so much raw material to be worked up into grasshopper tissue, for the food is swallowed into that diges-



tive laboratory with which in one form or another every animal body is provided.

But how account for the "molasses"? We certainly do not enjoy it, and that, no doubt, is the grasshopper's unfriendly reason for using it. He hopes to dismay us and force us to let him go. He might succeed if we were as small as himself, but at our size his ridiculous molasses is as futile as his protesting kicks.

To a meddlesome insect, however, it might prove very disastrous, sticking to face and antennæ and making him ill from the bad odor and very disagreeable taste of it. This

molasses, in short, is the grasshopper's rather pathetic weapon of defence; and there are insects that have developed the idea to an



extravagant degree, being able to assault the sensitive olfactories of their foes with odors which no foe could endure, a hasty retreat being infinitely preferable to the further pursuit of their purpose.

We have an illustration of a similar habit much nearer our end of life in that otherwise inoffensive and rather pretty little fellow we call a skunk. He has no claws fit to tear us and no teeth fit to bite us, yet how glad we are to let him alone!

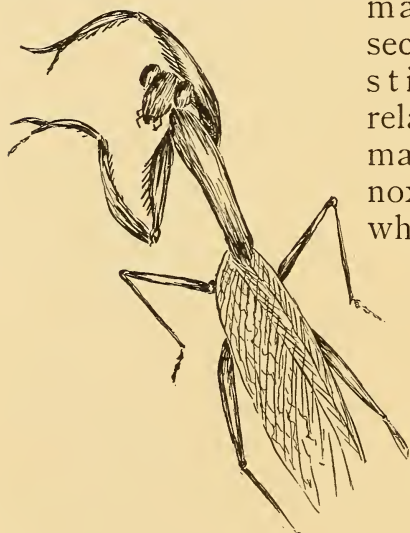
And in the insect world, who does not remember with strong emotion the little round flat stink-bugs that love to disport

themselves on clusters of ripe raspberries! Who has not had the awful experience in the course of his headlong and trusting childhood of popping one of these bodily into his mouth with a handful of luscious berries? In spite of the aroma of the berries, how indescribably opposed to luscious is the result!

Among the near relatives of the grasshoppers we remember the mantis, which, though so fierce a cannibal, is not provided with very good legs for jumping, or with very good wings for flying, or with a disposition to use any of these things if he had them. He will not fight anything but an insect, nor run away; but if you take hold of him, unless you have a very determined nature, you will gladly let go, for he quickly smears your fingers with a liquid which has a most offensive odor even to our comparatively dull sense of smell. Then what must it be to the sensitive feelings of his own kind? He greedily eats other insects, but he has no mind to be himself eaten if by any power of repulsion he can help it. Our Southern negroes call him "mule-killer," believing his obnoxious liquid to be fatal to the life of that tough subject, the mule. This is far from the truth, however, and the mule that lives until killed by a mantis will have a long and weary road to travel.

As though to be as offensive as possible,

the mantis does not confine himself to spitting unfriendly liquid from his mouth, but discharges it from the upper segments of his front legs, — a distressful practice not disdained by



many handsomer insects. The walking-stick, a harmless relative of the mantis, makes himself as obnoxious as possible when disturbed, by discharging a disagreeable white liquid from the fore part of the thorax. Even the crickets, when captured, give forth an ill smell-

ing fluid from the abdomen. But the most unpleasing of the grasshopper's relatives is our enemy the cockroach; he has most vile-smelling glands located in the abdomen, which, no doubt, is one reason we dislike him so. It is hard enough to have him help himself to our food, but when he also spoils everything he touches by the intolerable odor he leaves behind, no wonder he is universally loathed.

The grasshoppers and their near relatives are not the only insects that offend in this way. The whole insect world is very generously

supplied with malodorous glands as a means of defence, some having them located in the legs, some in the thorax, some in the abdomen. Some slowly discharge the offensive fluid, others squirt it out. Sometimes the gland that contains the liquid is turned inside out, as in the case of the bright green-and-black striped, yellow-spotted caterpillar we often see feeding on caraway or parsnip. We know what happens if we poke him; out is thrust a pair of soft, bright yellow horns just back of his head, and presently there creeps through the air the most overpowering stench, his protest against being poked. Birds find him as ill-tasting as he is ill-smelling, and gladly let him alone.

The varieties of malodorous scent glands are sufficiently numerous, one should think, to accommodate any reasonable insect; but the terrible oil-beetle will none of them, preferring when teased to shed precious drops of blood from the joints of his legs — blood so acrid that it raises a blister on meddling fingers. It is to be hoped, for their own sakes, that these vile-smelling creatures are not sensitive to their own odors; doubtless they are not, or they would not be so willing to inflict a punishment they themselves had to share.

Not all odorous insects are disagreeable; it is probable that the smells emitted, even the vile ones, are useful in other ways than

repelling an enemy. Naturally members of the same family would not be distressed by what might be called the common family odor, but, smelling it, would know just where to seek the one who gave it forth; and among certain beetles we know that the scent gland is used by the insect to call its mate.

Returning now from our long excursion through the realm of scent glands to the grasshopper's mouth, we find those amusing little finger-like processes to be inquired into. They certainly take the place of fingers to poke the food into the mouth and hold it there, and if we look long enough we shall discover two pairs of them. If we were to spend time enough over it, we should discover, too, that those wiseacres are right who say that all insects have them in one form or another, though they are often modified to such an extent as to be unrecognizable. The grasshopper is constantly moving his in a funny way that delights little children, and even those of a larger growth; and it is with them he grasps the soiled foot and thrusts it into the ever ready mouth, as well as the antennæ, which need careful and frequent cleaning to keep their sensitive spots from becoming clogged with dust.

It would be puzzling to guess how the grasshopper gets hold of organs floating airily from the front of his face, since the

mouth fingers are very short, entirely too short to reach even the root of the antenna; but the summer idler who has been hobnobbing with grasshoppers all this time knows perfectly well how it is done. He knows that the grasshopper, as any sensible creature would, uses his fore leg for the pur-



pose, putting it up over his head and crooking the elbow about that end of the antenna nearest the face, then drawing it back to place, holding the captured antenna, which the

mouth fingers are ready to grasp as soon as it comes within reach. These wise idlers also know that the grasshoppers with the numerous foot-pads prefer to wipe the antenna on these instead, all they have to do being to catch that airy appendage and step on it, when as it is drawn back to place it will be pulled against the soft little foot-pads, that thus humbly but honestly serve as a washcloth. When the grasshopper wishes to clean his neck and the underside of the thorax, as sometimes happens, it is worth being on hand to see the little head bent down and under the body, the short neck stretched to the utmost to enable the cleansing mouth to reach the desired point. But the best moment of all is when one polishes the long ovipositor at the extreme tip of the abdomen; now the insect is rolled up like a hedgehog, with head beneath the curved back, though still standing upright on the patient legs.

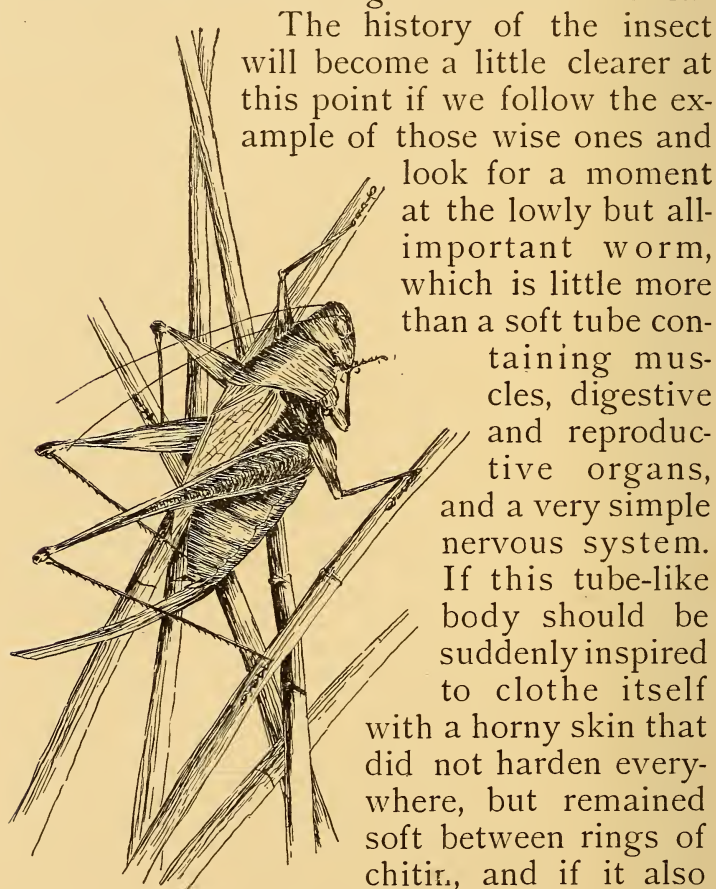
Head and thorax bearing as they do the interesting organs of locomotion and the equally interesting eyes, antennæ, and mouth parts hold the first attention of the summer idler. In course of time he begins to discern cause for interest in the abdomen, that hinder portion sans appendages and so very evidently composed of rings, — a part which has little to charm the eye, but which to him

who can read the signs tells a tale almost as alluring to the imagination as the growth of fair wings. The rings of the abdomen are the key to the structure of the whole insect. The thorax also is composed of rings, but these are so closely welded together that we do not discover them without the closest scrutiny. However, it is not over difficult for any one to assure himself that this is the fact and that the thorax is composed of three rings, each bearing a pair of legs, while the first ring bears also the wing covers, and the second the flying wings.

The rings of the abdomen are not welded together, and they bear no appendages. They can move back and forth on each other like a telescope, being connected by a soft membrane, and this arrangement enables the body to wriggle if touched.

It is quite evident that the abdomen is much more like the ancestral worm than any other part of the body. No doubt countless generations ago the ancestor of the grasshopper did not have a part of its body-rings modified to carry legs and wings, for that we now see is what the thorax is, — merely modified rings. Nor will it surprise the complaisant summer idler, ready now to believe anything, that those who have made it their business to find out, insist that the head also is composed of some half-dozen rings so

closely grown together and so modified that it took even them a long time to discover it.



The history of the insect will become a little clearer at this point if we follow the example of those wise ones and look for a moment at the lowly but all-important worm, which is little more than a soft tube con-

taining muscles, digestive and reproductive organs,

and a very simple nervous system.

If this tube-like body should be suddenly inspired to clothe itself

with a horny skin that did not harden everywhere, but remained soft between rings of chitin, and if it also divided these rings

into several parts by remaining soft on the sides of each ring, we should get a creature everywhere similar to the abdomen of the grasshopper.

It is easy now to see how certain of these rings, growing larger and becoming more solidly attached together, might develop into the thorax; and even how the head might be formed of rings very closely welded together and very greatly modified, the little feelers about the mouth being made of several joints, and having in truth an origin identical with that of the legs, being merely developed differently in order to do a different work.

The worm became moulded into an insect by a profound but not incomprehensible modification of its tube-like body, in obedience to that glorious command which compelled living matter to go ever on and up, until out of so simple a beginning as a worm-like form even proud man himself was evolved.

Man never passed through the insect stage, but travelled out in another direction, escaping the bondage of the ringed form.

Although the abdomen of the grasshopper is of so primitive a form, it has one noble office, — it supports the breath of life.

Depending like ourselves on the air it breathes, and being devoid of lungs, the insect has substituted a system of air tubes that run along inside the abdomen and carry air to the blood. These tubes, opening by little pores along the sides of the abdomen, are easily seen in the grasshopper and yet

more plainly in some of the large caterpillars, where they have a ring of bright color about them.

If we hold a grasshopper, we can distinctly see it breathe; we shall also discover the wisdom of not having the abdominal rings solid like a finger ring, for the abdomen opens and shuts with every breath along two soft lines that run its whole length down either side, and near these soft lines are the breathing pores. Each abdominal ring is composed of four separate pieces connected by soft tissue, the largest one on top, covering the back, one on either side, and one beneath. Thus the abdomen can be distended to a certain extent and can allow of the breathing movements.

The nutritive fluid in the insect body is not usually red, yet it may be justly called blood. That certain human beings claim to have blue blood everybody knows, though fortunately for them this is not literally true; with the insects, however, it might be, for their blood is variously colored or not colored at all. A certain Florida fly, for instance, if shedding his heart's best blood, would shed it bright green.

But, whatever its color, blood needs the oxygen of the air to enable it to do its work. Since the blood of the insect does not circulate through veins and arteries, but must

find its way about through less perfect channels, it is fortunate that it is not obliged to proceed in an orderly current to any air-station, but that the air comes to it through the abdominal tubes. However, the abdomen does not monopolize this important function, there being also a few spiracles, or air-openings in the thorax at the base of the wings, where the body is soft and admits of sufficient motion to pump in the air—perhaps when the wings are moving.

Nor is the insect quite dumb, in spite of his lack of lungs, for he makes the most of what he has. We find his spiracles—at least in some cases—fitted with a vibrating membrane that emits a true though simple tone,—in short, a voice.

The summer idler would feel justly imposed upon if asked to believe that a grasshopper can talk, though we know how well he can sing. Indeed he cannot talk, nor has he, properly speaking, any voice at all; but the bees are true vocalists, though so far as we know they have not formulated any dialect for sustaining conversation at home; the best they can do—at least so far as they have let us into the secret—is to scream for mercy when we catch them. Then they throw all their spiracle membranes into the most violent agitation, an agitation that sets abdominal rings and thorax into such a state

of vibration that you can distinctly feel them if you hold a bee in your fingers. If you are not careful you may feel something else yet more poignantly, though it is an easy matter to learn to hold even a bee without getting stung.

VIII

SWORDS, STINGS, AND DRILLS

THE grasshopper, loved companion of our childhood, has no sting and no disagreeable habits whatever, excepting the absurd one of daubing us with molasses. Yet some of the tribe seem to bear a sword, the abdomen terminating in a goodly blade that might alarm us if we did not know so well the disposition of these gentle sword-bearers. The formidable-looking blade is simply an ovipositor, with no more sinister use than to deposit the eggs in a safe place, slitting grass-stalks or reeds for the purpose, or sometimes digging a hole in the ground. Consequently it is the possession of the females only, and is borne by those of all the long-horned grasshoppers as well as of the crickets.

Much less pretentious, but far more effective as a drilling machine, is the ovipositor of the short-horned grasshopper, which, in keeping with the stout and more compact build of the creature, is short, pointed, and very strong. It is made from the final segments

of the abdomen, which are modified into four short, triangular pieces that fit together into a point when at rest and are quite inconspicuous. When the moment of action arrives, however, this closed drill is pressed firmly into the ground, then opened, forcing the earth aside to make a hole as large as its body; again the drill is closed and its sharp end thrust farther in, to be again opened. This operation is repeated until the persevering miner has bored a hole as long as its abdomen.

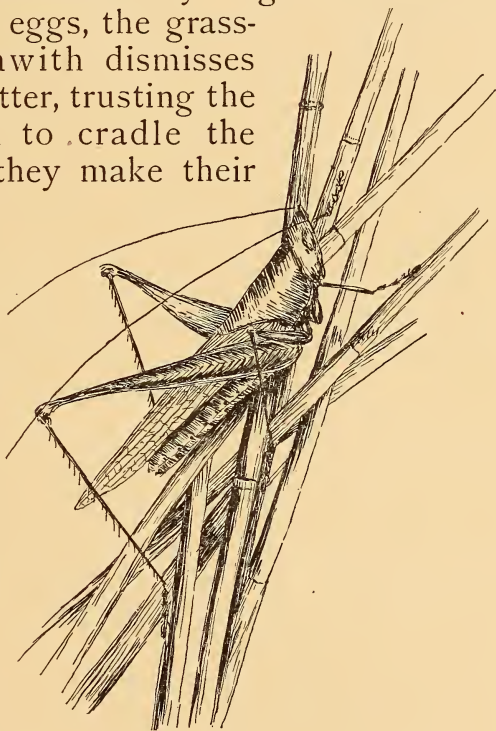
Such is the strength of this tool in some species that it is used successfully for drilling holes in old logs and even in fence rails.

The hole having been made, the eggs are placed in it, beginning at the bottom. Thus the first laid eggs are lowest down. When the young hatch—the lower ones presumably coming out first—how are they to escape without disturbing or even destroying the eggs above? It would be a careless insect that did not make provision for such a chance. So we do not find the eggs laid in a solid mass, but very prettily disposed around the edges of the hole, leaving an open space in the centre through which the newly hatched can easily ascend to the upper world. The eggs are embedded in a sort of resinous material that affords them protection. This also plugs up the hole, but is easily broken

by the emerging insect. Thus each nest of eggs can be removed in one unbroken mass by any one desirous of collecting them.

Having conscientiously dug the hole and deposited the eggs, the grasshopper forthwith dismisses the whole matter, trusting the kindly earth to cradle the young until they make their way out into the wide world the following season, very small and weak but not at all afraid, and amply able to take care of themselves.

Although the grasshopper tribes never use the ovipositor as a weapon of defence, there are insects that have been quick to avail themselves of so obviously good a chance. Such are the bees, whose ovipositor, as most of us have reason to know, is a very pointed argument in case of disagreement, its attacks being venomous as well as sharp;

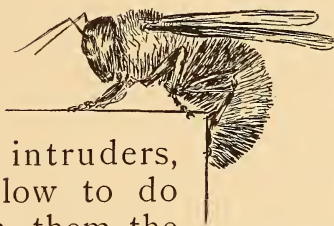


for this ingenious ovipositor, besides being as sharp as a needle, has connected with it a bag of virulent poison for the further admonition of the presumptuous.

Knowing these facts, the philosopher readily infers that it is the female bee alone that stings, notwithstanding the warlike nature of the tribe. The truth seems to be that the necessities of life have transformed the whole sisterhood into a race of most pestiferous Amazons, who make war upon slight provocation, attack besieging enemies with alacrity, and regulate difficulties at home, always to the discomfiture of any drone, or male bee, that may be involved. For in a hive the worker bees are all females, though too imperfectly developed to successfully repeople the hive — keeping, however, the ovipositor in full operation as a sting to be freely used in time of need or bad temper.

The sting being a modified ovipositor, it follows that the unfortunate drone has no weapon at all. He is as harmless as a blue-bottle fly, and like that he can make a great noise, though he is quite unable to back up his threats with any deed of vengeance. He can be picked up with perfect safety, and any one so desiring can hold this very dangerous-looking insect in his hand for the wonder and admiration of less sophisticated friends, — only he must be sure to catch the right bee!

The wasps, which are near relatives of the bees, put their powerful stings to another use than punishing intruders, though they are not slow to do that as well; but with them the sting is a spear sure to hit the mark, and with it they go hunting. For the wasp, unlike the grasshopper, cares for her young, which hatches into a very helpless infant indeed, closely resembling the far-away ancestral worm, though much more helpless than that ever was. The mother wasp, realizing the condition in which her offspring will enter the world, plans accordingly. Some wasps form communities similar to those of bees, and build nests, feeding their tender young as the birds feed theirs; others live a solitary life, each one digging a hole in the ground for the reception of the egg and provisioning it carefully, knowing very well that a good supply of fresh food will soon be needed. Such are the big black wasps often seen digging holes in garden walks,—digging, not with the ovipositor, but with the front feet, very much as an impetuous dog digs into a woodchuck hole. The nest completed, off goes the wasp to the nearest hunting-ground, where she soon selects a plump grasshopper, pounces on him, stings



him relentlessly, and carries him home, not dead, but effectually quieted; for the poison in the sting has the power of paralyzing the victim without killing it. In this convenient condition it is stored in the nest, an egg laid on it, and the hole covered up to await events.

It is probable that thus originated the poisoned sting of all the bee-tribe — first a means of securing prey, afterwards a weapon of defence. For even the honey-bees



have in all likelihood developed from insect-consuming ancestors, confining themselves at length to a diet of honey and pollen which they gather from the willing flowers without any need of poisoned sting, but keeping that as a memento of the past as well as an effective argument to vindicate their rights.

The safe placing of the insect egg is a very important matter, for as Fall advances and the air grows cold, most of the insects perish, leaving only the little egg to continue their race the following year. The grasshoppers,

in temperate climates, fall under the numbing hand of death as Summer closes, only an occasional one hiding away in some warm corner to come out again in the Spring. As a rule, all that remains of the populous grasshopper world after the cold weather comes is countless collections of tiny eggs down in the earth and tucked away in rotten wood, in plant stalks, or on tree branches. The grasshoppers have passed away, leaving the earth sown with hopes for the future.

When we walk over the winter fields, we think we are alone with the leafless trees and the snow-covered earth, but beneath our feet lie innumerable living eggs, grasshoppers in the seed, as it were, waiting for the warm spring sunshine to touch the bushes and the grass to life and to wake these millions of eager creatures to come forth and begin their joyous career of gormandizing. Nor do they appear too soon. The first spring warmth does not stir their sluggish blood, for if they arrive before the foliage, starvation must be their portion; so they wisely lie still until all nature has conspired to set their table and put their home in order; then out they come trooping, to hop, and then to fly and sing and mate and lay their eggs and die—the same cycle over and over, yet always new and wonderful.

IX

THE FAMILY TREE

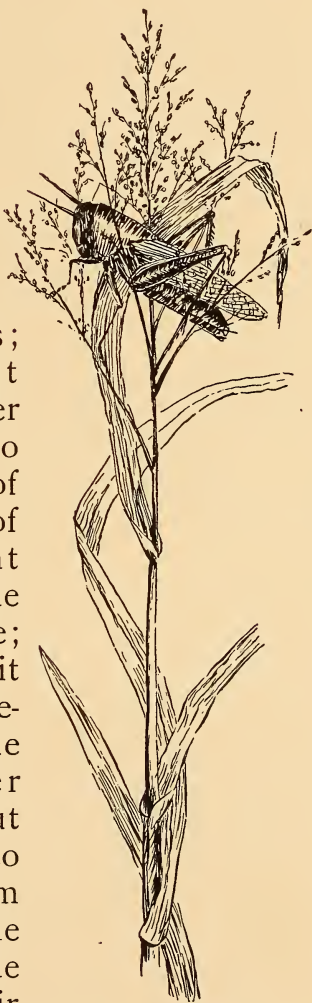
THE more we poke about the meadows and hedgerows, peeping at the crickets, prying into the affairs of the grasshoppers, the more we are interested in this large and joyful family, and the more we are willing to know about them.

A large family they indeed are, including some five thousand species; and a very old family, which accounts for the extreme simplicity of their make-up as compared with later evolved and more complex insects. Their history dates back of Adam, being recorded somewhere in geology when the world was younger than it is to-day by several layers. The family has grown so unwieldy with its many branches that it would take more time and opportunity than most of us possess to know it all; yet we can bring order out of chaos by thinking of it in groups, — large limbs of the family tree.

If we are going to the root of the matter, we shall have to glance at the whole Order,

to which belong not only the grasshoppers, but certain relatives that have certain other characteristics, though lacking that apparently conclusive family trait, the jumping legs.

But insect Orders are not founded on legs so much as on those later acquirements, the wings; and it is the straight fan-like plaits of the hinder wings that have given to the honorable Order of Grasshoppers its name of *Orthoptera*, or straight wings. Not that this is the only point of resemblance; indeed, to the outsider it must seem very inadequate, particularly as some members of the Order have no wings at all; but since it is the custom to name insect Orders from some peculiarity of the wings, *Orthoptera* the grasshoppers and their near of kin are. Besides the wings there are other well-marked characteristics of structure



common to all members of the Order which show them all to have been descended from some far-away common ancestor, just as all our fancy pigeons with their ruffs and fan-tails are the grandchildren many generations removed of the untamed and unadorned rock pigeon.

Now to the Orthoptera belong certain families that at first glance would seem to have no right there; but a more careful examination would show them to be of Orthopteran pedigree, only modified through long lapses of time in various ways to adapt them to the life they have chosen.



Thus cockroaches are Orthopteran insects; also the gentle walking-stick and the haughty mantis.

To aid our memories, we may group these various forms into four divisions: Running Orthoptera, or cockroaches; Grasping Orthoptera, or mantes; Walking Orthoptera, or walking-sticks and leaf-insects; Jumping Orthoptera, or grasshoppers, katydids, and crickets.

Since the last group is altogether too large and complex for convenience, we may subdivide it into three parts: (1) the Short-horned

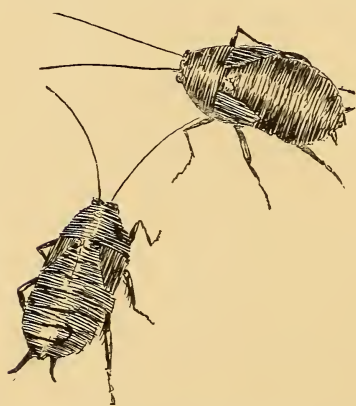
Grasshoppers, or locusts; (2) the Long-horned Grasshoppers, or meadow-grasshoppers, katydids, cricket-like grasshoppers, and shield-backed grasshoppers; (3) the Crickets.

Having them thus arranged in convenient groups, we can look at one after another with minds free from confusion.

X

THE SUCCESSFUL MANTIS

OF all the tribe the least agreeable are the running Orthoptera, which include the Croton bugs, or water bugs, as they are also called, — all of them cockroaches and all of them offensive, though as a family they are not entirely devoid of interest, however much we may



detest them as individuals. In fact, to the entomologist they stand among the most interesting of all insects, and have been very carefully studied, their structure, which is easily examined, having thrown much light on the history of

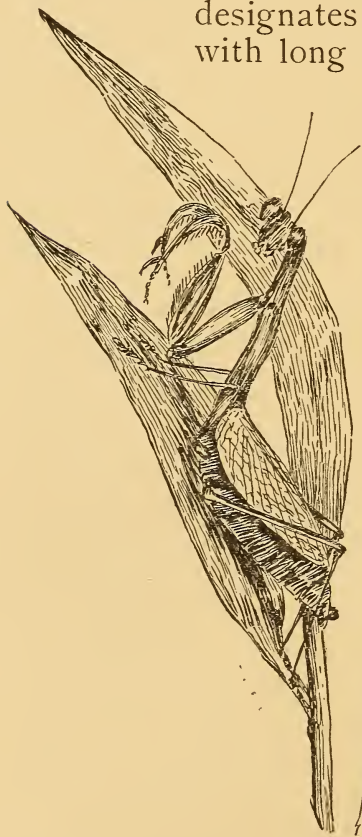
insects. Nevertheless, our gratitude is so tempered with other emotions that we will say a cheerful good-bye to them and pass on to the mantis; with him we will gladly linger, for though he may be intrinsically no better than a

cockroach, at least his ways do not offend us personally, but on the contrary are most amusing, while historically he is an insect of renown.

A New Englander will look a long time before he finds a mantis in his native pastures; in fact he may spend his life in the search with no better reward than Simple Simon had when he went to pick plums from a thistle. But a Georgian will have no trouble. Indeed, he need not even go to the mantis, the mantis will come to him; for it is a common denizen of the South, and is often seen standing expectant on a vine before the door, striking its impressive attitude, with prayerful arms extended to embrace a neighbor.

No wonder this strange-looking object has excited fear or veneration in the mind of man from remotest times and in all countries, and no wonder it has brought upon itself such names as devil-horse, rear-horse, snake-doctor, and — more politely — prophet and soothsayer. These last two, entirely undeserved, only go to show how vastly appearances count in this credulous world, for because of its absurdly devotional attitude the mantis from time immemorial has been credited with supernatural power. It has also been received into good literature, even that of Anacreon the poet, who sang of it as the herald that

announces the coming of Spring; and of Theocritus, who in one of his idyls, with more poetry than truth, we hope, thus designates a slender young girl with long thin arms.



The name mantis is of Greek origin, and means diviner; and little as we may believe in the supernatural power of the

grotesque insect, we must take off our hats to it when we learn that it was observed by the Greeks in soothsaying, even as the flight and motion of birds were observed; and no doubt it was

known and revered by those enthralling heroes that fill the ever-fresh pages of Homer.

The mantis is found over most of the warm parts of the globe, and while with us it is a simple, unadorned creature, in some

parts of the world it is most grotesquely ornamented with leaf-like excrescences on legs and body.

Wherever found, its story is the same; respect, fear, reverence, even worship being accorded to it. In South Africa, where it is called the god of the Hottentots, he who kills or hurts a mantis will never again be lucky and never again able to shoot an elephant or a buffalo. Many indeed are the travellers' tales of the regard felt by those people for the absurd little insect; yet it is not necessary to go to the Hottentots for proof of the veneration it is able to inspire, since among the legends of the gentle St. Francis we read that "Seeing a mantis moving along in its solemn way, holding up its two fore legs as in the act of devotion, the Saint desired it to sing the praises of God; whereupon the insect carolled forth a fine canticle."

Besides figuring in matters of such moment, the mantis, like our daddy-long-legs, good-naturedly responds to a certain query, as is thus explained by a quaint old writer: "So divine a creature is this esteemed, that if a child ask the way to such a place, she will stretch out one of her feet and show him the right way, and seldomme or never misse."

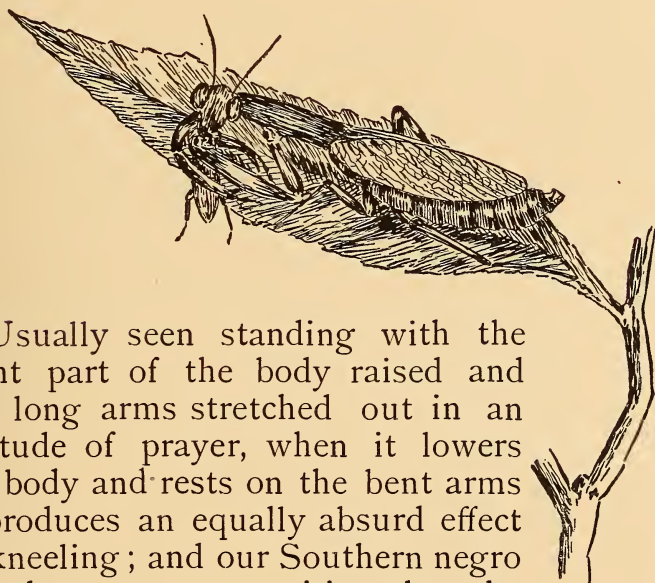
The same writer continues doing more than poetic justice to the questionable manners of

the impostor: "As she resembleth those diviners in the elevation of her hands, so also in likeness of motion, for they do not sport themselves as others do, nor leap, nor fly, but walking softly she retains her modesty, and shoves forth a kind of mature gravity."

This very modest, grave, soft-moving insect so impressed the Moslem with its pious attitude that he venerated it as a fellow-worshipper and treated it with the greatest consideration.

In many parts of the world to kill or hurt a mantis is considered a great misfortune, to be followed by dire consequences, while to have it light on one is an omen of good luck. In our own South, however, the feeling with regard to it is not always one of pleasure; to have it cross one's path is, at least in some sections, a sign of ill luck, while to see one flying is a sign that a snake is somewhere near, probably in need of its services, as it is believed to minister to sick snakes. In some parts of the South to have it alight on one is a sign of good luck, for if it settles on the hand one is to become acquainted with some distinguished person, while to have it settle on the head is a sign that one is soon to have some great honor conferred on him. To kill it is to invite misfortune, as the creature bears a charm against evil.

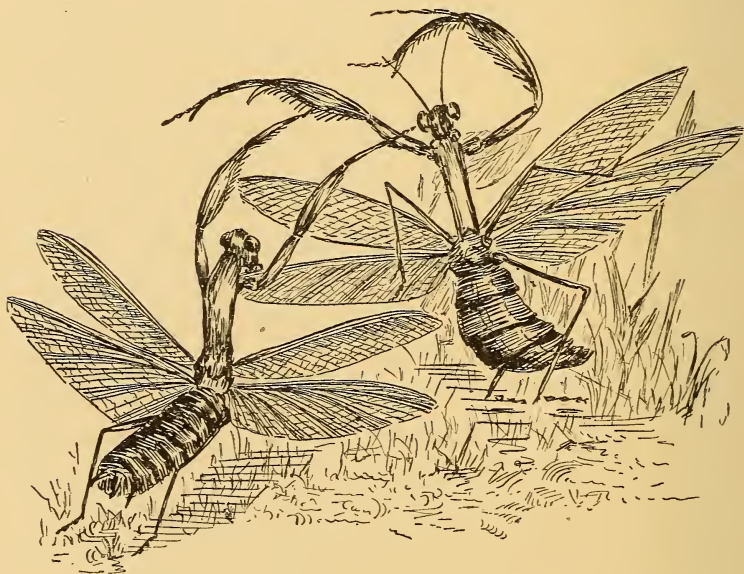
We, like the snakes, it is said, can profit by its curative power, though only by a display of the utmost ingratitude; for, when afflicted with rheumatism, if we can screw up our courage to the point of biting off the head of the healer, it is believed we shall forthwith be made whole.



Usually seen standing with the front part of the body raised and the long arms stretched out in an attitude of prayer, when it lowers the body and rests on the bent arms it produces an equally absurd effect of kneeling; and our Southern negro has the pretty superstition that the creature kneels when it sees an angel or hears the rustle of its wings.

There is no denying that the great eyes of the mantis, and its habit, shared by no other of its race, of turning its head sideways to look at you, give it a very intelligent expression; it is too bad to have to add to its

divine attributes the very unrighteous one of an inordinate love for fighting. It would rather fight than eat, and takes unbounded satisfaction in nipping off a neighbor's head. The female, being larger and stronger than the male, is often guilty of eating her mate ;



and the young, if confined in the same cage, greedily devour one another. Two cannot live together in the same cage, for as soon as they see each other war is declared. Up go their heads, their fore legs are brandished, as though to say, "Come on if you dare!" Thus they wait, eying each other with the greatest ferocity, until one suddenly opens

its wings and rushes savagely upon the other. They fence and strike with the sharp edge of the fore claws, one at length decapitating or otherwise fatally wounding the other, when the conqueror, doubtless having whetted an always ready appetite by exercise, speedily devours the fallen hero.

In Java, where the mantis is highly valued for its savage temper, the natives amuse themselves with mantis fights, just as people who consider themselves more civilized extract pleasure from cock fights. The Javanese put up money on the result of the fight, quite after the fashion of their noble white-skinned brethren.

Among the solemn-eyed Chinese a similar entertainment is said to be so popular that during the summer-time scarcely a boy is without his cage of insect prize-fighters. Even our little mantes are set to fighting by Southern boys; and such is the creature's tenacity of purpose, or hatred, that having once taken hold, it will not let go until death or victory decides the contest.

Our mantis, though large for an insect, is small compared with certain monsters in South America, which sometimes catch little birds in their fatal embrace.

With its other peculiarities the mantis makes quite a charming pet, being easily tamed and not lacking in at least the

semblance of affection for its owner. One appreciative mistress of a tame mantis has told the tale of its captivity so graphically that, having read it, one feels forever after a certain familiarity with the contradictory little creature, and a certain personal friendship for Queen Bess, which was the distinguished name of the mantis in question.

It would be a pity not to let the lady tell the story in her own words, which are as follows :

“Queen Bess, of famous memory, would alight on my shoulder and take all her food from me half a dozen times a day. When she omitted her visit, I knew she had been hunting on her own account. All night long she would keep watch and guard under the mosquito-net, the silk thread that bound her being fastened to the post of the bed ; and woe betide an unfortunate mosquito who fancied for his supper a drop of claret ; it was the drollest, the most laughter-moving sensation, to feel one of these trumpeters saluting your nose or forehead, and hear Queen Bess approaching with those long claws, creeping slowly, softly, nearer and nearer ; to feel the fine prick of the lancet setting in for a tipple ; then you would suppose a dozen fine needles had been suddenly drawn across the part ; then, presto ! Bess’s strong, sabre-like claws had the jolly trumpeter tucked into her capacious jaws before you could open your eyes to ascertain the state of affairs.”

A truly useful pet, though some of us might have a troublesome prejudice against such a watch-dog tied to the bedpost !

Queen Bess, having a most decided personality, could not bear to be slighted, and her faithful chronicler tells us:



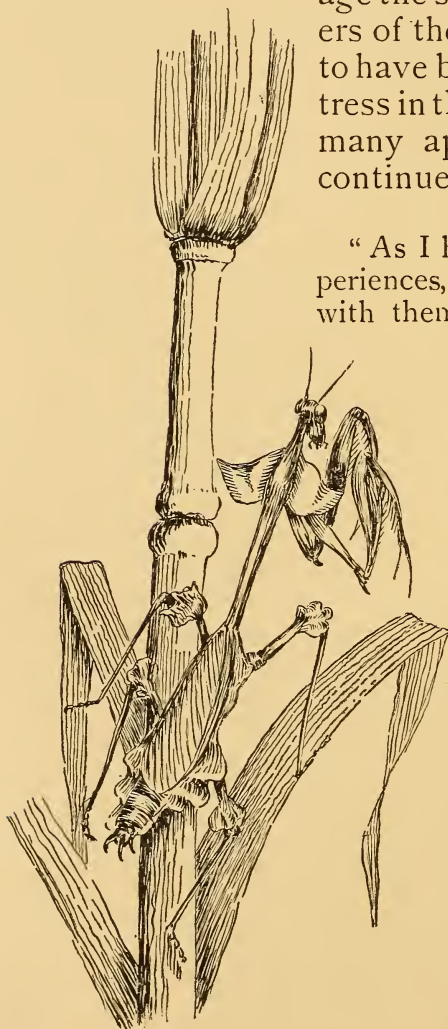
“As sure as she saw me bending over the magnifier with an insect, and I thought she was ten yards off, the insect would be incontinently snapped out of my fingers. Many a valuable specimen disappeared in this way. I learned to put her at these times in the sounding board of an Æolian harp, which was generally placed in the window. Her Majesty liked music of this kind amazingly. I presume she imagined she was serenaded by the singing leaves of the forest. I knew she would have remained there spellbound until driven forth by hunger, if I did not remove her when I was not afraid of her company.”

Although one must doubt in this prosaic age the supernatural powers of the mantis, it seems to have bewitched its mistress in this case, who with many apologies naïvely continues thus:

“As I have begun my ‘experiences,’ I will go through with them and confess that

I was obliged from circumstances to attach more than accident to her prophetic capacity — her fortune-telling. I have not a grain of superstition to contend against in other matters, having so much reverence for the Creator of all things that I certainly have no fear of anything earthly or spiritually conveyed to the senses. But I was taught by the saddest teacher, Experience, that whenever Queen

Bess’s refusal went unheeded I was the sufferer.



The first time I ever tried it was to determine a vacillating presentiment I felt about trying a new horse whose reputation was far from good. I placed Queen Bess before me, held up my finger: 'Attention! Queen Bess, would you advise me to try that horse?'

"She was standing on her hind legs, her antennæ erect, wings wide-spread. I repeated the question. Antennæ fell; wings folded; and down she went, gradually, until her head and long thorax were buried beneath her front legs. I took her advice and did not venture. Two days later the horse threw his rider and killed him.

"Here was the turning point. Was I to allow such folly to master me? If French girls do take a mantis to the junction of three roads, and ask her on which their lover will come, and watch the insect turning and examining each road with her weird sibyl head,—if French girls commit such follies, should I, a staid American woman, follow their example, putting my faith in the caprices of an insect? Pshaw! I was above such folly. So the next time Queen Bess was consulted a more decided refusal was given; but I disregarded her warning, and most sorely did I repent it. Again she would approve, by standing more erect, if possible, spreading and closing her wings; then all was sunshine with me. . . . I never, in one single instance, knew her to refuse her opinion; and I never knew it to be wrong in whatever way she announced it."

Although we may not feel the same confidence in the divining power of Queen Bess, we are glad to have made the acquaintance of her Majesty.

Our mantis is clad in sombre or quiet green, like the bushes she frequents; but some of her tropical relatives are resplendent in bright colors, an apparent defiance of fate in the form of mantis-eating birds, until one realizes that these brilliant ones pass their time in showy orchids, whose colors they have borrowed as a safe though gorgeous disguise from both enemy and prey; for as the unsuspecting honey-lover comes for orchid nectar, the lovely flower suddenly lets out two trap arms, and the honey-seeker is speedily converted into a feast for the voracious occupant of the terrible orchid.

Living among the trees and bushes as it does, the mantis deposits its eggs in long clusters on the twigs, covering them with a tough waterproof substance, the mass of eggs having a curious braided appearance on top.

The young mantis resembles its parent in appearance, though it begins life without wings. As soon as it is hatched it raises its tiny arms in supplicating attitude, and regales itself on whatever small insect it can clasp in its unbrotherly embrace. It is quite harmless, both physically and morally, in spite of all that has been said and sung to the contrary, and it is our friend, not by virtue of banishing disaster by lighting on us, but

because by living exclusively on insects it helps to keep those boundless ravagers in check.

So here's to Queen Bess and all her family! May they live long and prosper!

XI

HARMLESS FRAUDS

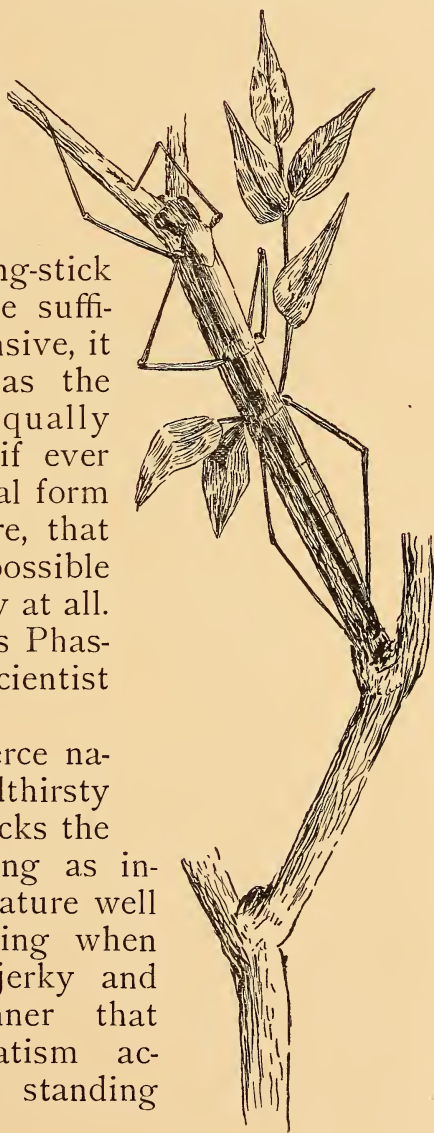
THE summer sprites seem to be taking strange liberties with us, as, after lying on the warm earth and watching grasshoppers with most amusing but always comprehensible results, we one day see a twig detach itself from a bush and move off! Very likely our gaze had been idly fixed on that very twig when it startled us by coming to life, and we rub our eyes to see if we are perchance dreaming. But the twig continues to move, and now we see it has legs and—in short it is not a twig, but a very cleverly disguised insect.

Once informed that it belongs to the Orthoptera, there is no difficulty in believing its place to be in the division of Walking Orthoptera, as we watch it leisurely pursuing its way with equal legs, none of which show the slightest tendency to become modified into organs for grasping, jumping, or playing any other undignified pranks. It is the walking-stick, excellently well named, though

in spite of its mild temper it is evidently a near relative to the fiery mantis. Its family are all vegetarians, however, which makes a difference.

Although its name of walking-stick would seem to be sufficiently comprehensive, it is also known as the spectre, — an equally happy term, for if ever there was a spectral form it is this creature, that comes as near as possible to having no body at all. Its family name is Phasmidæ, even the scientist feeling the spell.

Lacking the fierce nature of its bloodthirsty relative, it also lacks the terrible arms, being as inoffensive as a creature well can be, and moving when disturbed in a jerky and stiff-jointed manner that suggests rheumatism acquired by much standing



about in damp places. It resembles its cannibalistic cousin in preferring a slow and gentle gait to any sort of hurry; also in its style of dress, donning for its safety the quietest of greens and browns to deceive those birds that go prying about in search of insects for breakfast.



Its thorax is as long and slender as its abdomen, yet it is a true thorax, to which three pairs of legs are attached, but at wide intervals instead of being grouped close together; and as it so hates to exert itself it has entirely lost that glory of its race, — wings for flying. At least this is true of our New England variety, and even of many Southern forms, for the farther south we go the more often will the walking-stick cross our path,

until when we reach the tropics we can if we like pick up one nearly a foot long ! Even at that illustrious size it will not hurt us, only sprawl about with its great legs in a manner that might be trying to some nerves.

Our walking-sticks are not more than an inch and a half long, and since they have no wings whatever, are the oddest-looking of Summer's insect visitants. They eat the leaves of forest trees, and as a rule do no harm, though occasionally they become too abundant for the good of the tree, when there is nothing easier than to lay a staying hand on them, for they drop their eggs on the ground without the slightest regard to where they fall or what becomes of them. True, they provide against accidents by making up in numbers what they lack in care, and so thick and fast do these eggs fall during the egg-laying season in a badly infested wood that they sound like rain pattering on the ground. The remedy is very simple: set a match to the dried leaves and underbrush in the Fall of the year. The eggs cannot live through fire, and thus a painless end is put to unborn thousands.

Although our walking-stick prefers to pass through life without wings, those enviable possessions are the birthright of his family, and not all divisions of it have cast them aside. As we might expect from such odd-looking

creatures, the wings are wonderful to behold. If we think we see a twig move when our walking-stick changes his place, we might imagine the leaves had come to



life when we see one of the winged forms suddenly start out on its travels. Flying is a secondary matter, to which wings may occasionally be put in time of need; but to keep safe hidden all the time, that is worthy of the most serious consideration, and the

wings make admirable disguises if used aright. So in the East Indies we find a leaf-insect, so called, with his wings large, brown, and crumpled in the most absurd manner, giving him the protective if not handsome appearance of a dried and withered leaf. Others of this outlandish family do not adopt dried leaves as the model of disguise, but wear green wings variously veined and marked to resemble living foliage.

No wonder the simple native of the lands occupied by the deluding leaf-insect shares the opinion of the birds and declares that in his country the leaves come down from the trees and walk about. In his humble opinion the leaf-insect starts life as a vegetable, growing from the tree like any other leaf, and when mature falls off, having by some natural process, which does not trouble his credulity, been transformed into an animal. It is only a step from this to the belief that the insect in time roots itself in the ground and again becomes a plant!

It might not be difficult to find a credulous few, who are not natives of a tropical country and who live even in this day of universal knowledge, who hold a similar opinion concerning phenomena that could only be explained by somewhat careful investigation; it is from a book written not so many years ago that we get in all seriousness and in

full detail the *modus operandi* of such a metamorphosis:

“Those little animals change into a green and tender plant, which is of two hands’ breadth. The feet are fixed into the ground first; from these, when necessary, humidity is attracted, roots grow out, and strike into the ground; thus they change by degrees, and in a short time become a perfect plant. Sometimes only the lower part takes the nature and form of a plant, while the upper part remains as before, living and movable; after some time the animal is gradually converted into a plant. In this, Nature seems to operate in a circle, by a continued retrograde motion.”

To read so serious and circumstantial a description of this wonderful transformation almost makes us believe it in spite of modern science, which has told us so much truth and spoiled so many pretty stories.

XII

THE MIGRATORY LOCUST OF THE EAST

AMONG the Orthoptera, far and away the most celebrated are those belonging to the division of jumpers, and among these the short-horned grasshoppers or locusts are preëminent.

If we glance back through our summer days, we shall remember that these are distinguished by the antennæ, which are shorter than the body ; the ovipositor, which is short and pointed, never long and sword-shaped or spear-shaped ; the feet, which have but three segments ; and the position of the ears, which is on the first ring of the abdomen just below where the wings are inserted. However, for the wanderer over summer fields the short antennæ are quite enough to tell who is who, these and the general coloring, which is a dull, dark brown, often relieved by dull green and sometimes touched up with red and yellow.

As to the habits of the short-horned group, we remember they oviposit in the ground, laying masses of eggs covered with a gummy

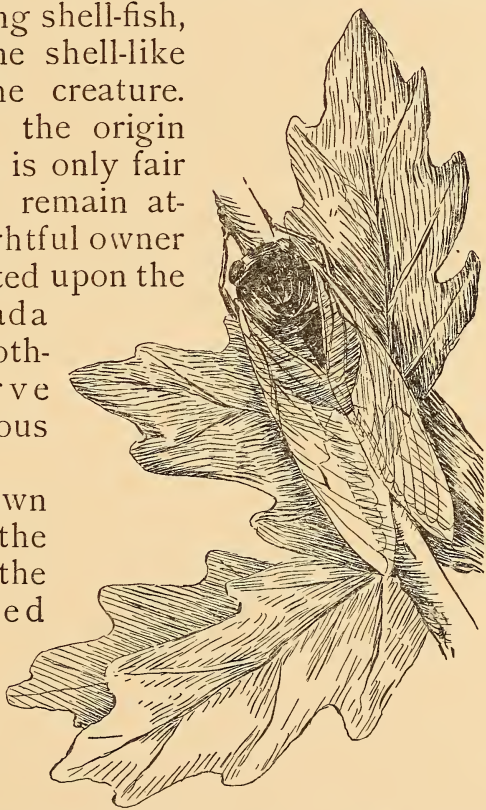
substance; but at least one species drills holes in wood for the purpose of egg-laying. They are also the best jumpers in the field, their hind legs being thicker and more muscular than in the other grasshoppers, while the femur has a groove running its whole length on the inside into which the tibia fits, thus enabling these two parts to be drawn extraordinarily close together. To end the list of their peculiarities, they fly better than they jump, vying even with birds in their power of sustained flight, for the wings are long and supplied with very strong muscles.

The whole insect appears to have been built for use rather than for looks, being much more compact and correspondingly less graceful than his long-horned brother. Considering the part it has played in the world, it certainly has need of every advantage in strength and agility that nature can bestow, for the short-horned grasshopper is none other than that terrible scourge, the *locust* of history. Our large and noisy dog-day harvest-fly or cicada has become so identified with the name among us that in some places to speak of a grasshopper as a locust would be misleading in general conversation. However, locust is the proper name of that sometimes fearful visitant, the short-horned grasshopper.

According to some the word "locust" is

derived from the Latin words *locus* and *ustus*, meaning a burnt place,—sadly significant of the appearance of the land after the settling upon it of a cloud of these insects. Others say the word comes from the Latin *locusta*, meaning shell-fish, because of the shell-like covering of the creature. But whatever the origin of the name, it is only fair that it should remain attached to its rightful owner and not be foisted upon the innocent cicada that has done nothing to deserve the ignominious distinction.

From the dawn of history to the present time the short-horned grasshopper has held a very high and unenviable place among the insects of the earth, vying with war and pestilence as destroyers of human life. The most renowned of the discreditable family are the so-called migratory locusts,



which at times leave their birthplace in vast numbers and swarm over other lands. Of these there are several species, though they all look very much alike, the most justly celebrated being the migratory locust of Egypt, which is large of size, measuring from two and a half to three inches in length, and has a brown body marked with dark green, with long dirty-brown, black-spotted wings, and red tibiæ.

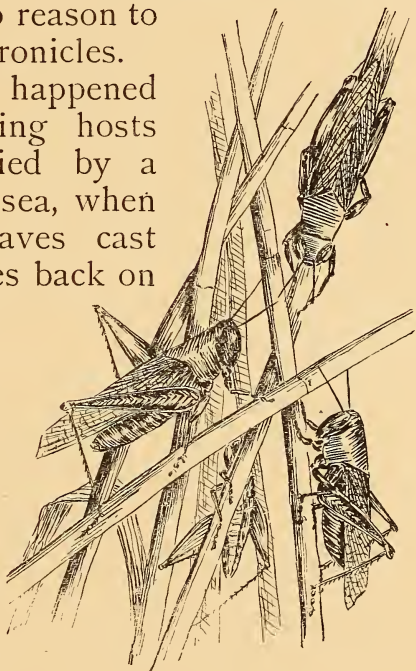
Of the appearance of this plague in Egypt and Palestine the Bible makes frequent mention, and in the Book of Exodus gives us one of the most vivid pictures in literature of the visitations of these pests:

“And the locusts went up over all the land of Egypt, and rested in all the coasts of Egypt: very grievous were they; . . . For they covered the face of the whole earth, so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees which the hail had left: and there remained not any green thing in the trees, or in the herbs of the field, through all the land of Egypt.”

From the beginning of time Africa has been the teeming nursery whence issued devastating hordes. It seems at times as though the very sands of the desert must have come to life to pour over the lamenting earth, while the desert winds lent their fury to spread the scourge even to far

distant shores. The descriptions of devastation and mortality incident upon the approach of these hosts of Satan read like fairy-tales, and stretch our imagination as well as our credulity, until the reports from later similar visitations within the sober realm of modern history leave us no reason to doubt the older chronicles.

It frequently happened that the destroying hosts were finally carried by a hurricane into the sea, when the indignant waves cast their lifeless bodies back on the shore; and it is doubtless this well-known dispersal by sudden and violent winds which the prophet Joel has in mind when he makes the Lord promise relief to supplicating Judea in the following exalted strain:

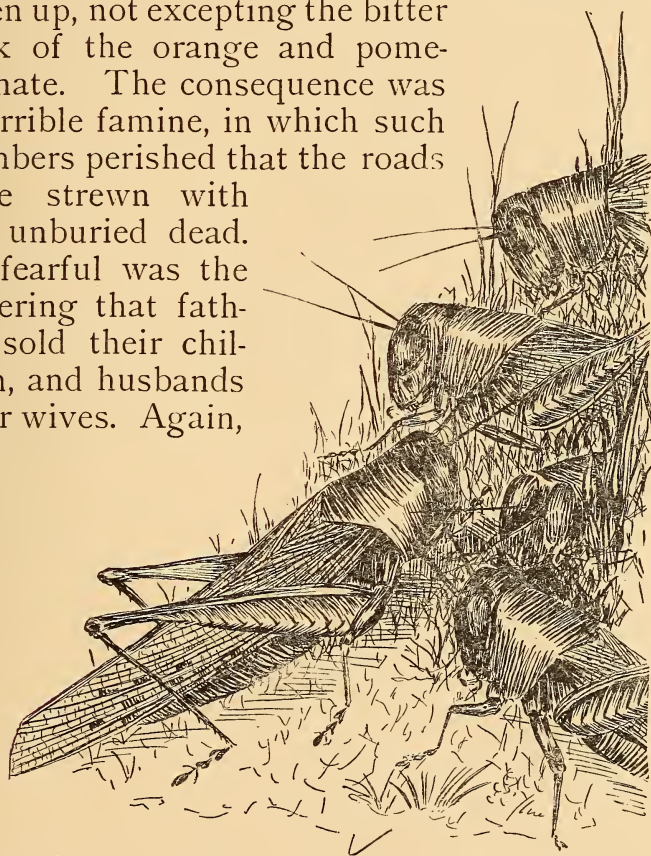


"I will remove far off from you the northern army, and will drive him into a land barren and desolate, with his face toward the east sea, and his hinder part toward the utmost sea, and his stink shall come up, . . . because he hath done great things."

Great things indeed ; and his stink coming up has often presaged a calamity as terrible as that of his living presence. In one instance, after a devastating host of locusts had been blown into the sea from the coast of Africa, the polluted shore is depicted as emitting a stench greater than could have been produced by the dead bodies of one hundred thousand men. The result of this festering mass, added to the consequences of the famine caused by the living locusts, was a general pestilence so great that in Numidia eighty thousand persons are said to have died ; while on the seacoast near Carthage and Utica the mortality was still more incredible, among the victims being thirty thousand soldiers who, stationed at Utica, were destroyed so rapidly by the raging plague that fifteen hundred are said to have been carried from one gate of the city in one day.

This fearful picture is paralleled by another drawn as late as 1797, when "two thousand square miles in South Africa were literally covered by locusts, which, being carried into the sea by a northwest wind, formed for fifty miles along shore a bank three or four feet high ; and when the wind was in the opposite point, the horrible odor which they exhaled was perceptible a hundred and fifty miles off."

Only a few years before this, from 1778 to 1780, Morocco was devastated by locusts to such an extent that every green thing was eaten up, not excepting the bitter bark of the orange and pomegranate. The consequence was a terrible famine, in which such numbers perished that the roads were strewn with the unburied dead. So fearful was the suffering that fathers sold their children, and husbands their wives. Again,



in 1779, Morocco was smitten from Mogadora to Tangier, when it is said that the face of the earth was covered with locusts from the desert of Sahara to the sea. Finally a

hurricane swept them into the water, when there followed the usual pestilence and mortality.

Although Africa undoubtedly deserves its reputation of being the breeding place *par excellence* of devastating hordes of locusts, it is only fair to say at once that it does not monopolize the distinction; Arabia, Persia, and many other parts of the world in both hemispheres have contributed innumerable hosts for the devastation of their own and other lands.

It is a well-known fact that swarms of locusts have been blown, or at least helped by the wind, from Africa to Italy and Spain, whence they have gone farther north to devour yet more distant regions.

There is on record such an occurrence in 591, when Italy repeated the history of so many African towns, being first devoured by locusts, and then stricken by so great a plague, as a result of famine and the putrefying masses of locusts piled on the sea-shore, that a million of men and cattle are said to have perished.

Again, France in 872 was visited by such clouds of locusts that they darkened the very light of the sun and consumed every green thing. They were blown at last into the sea and cast back dead upon the shore, when there arose such a plague as a result of their

presence, living and dead, that every third person in France is said to have died of it. Again, in 1613, the locusts visited France, and about Arles completely destroyed fifteen thousand acres of grain.

The Canary Islands, all too near the fatal continent, have been frequent sufferers from African hosts.



In 1649 the island of Tenerife was swept bare by them, and others of the islands were sorely troubled. We are told that the people saw them coming, gave the alarm, and, gathering together some seven or eight thousand soldiers from Tenerife and the neighboring island of Laguna, set them to work, not with

sword and gun this time, but with bags and spades, to face the formidable foe. Scouts posted on the hills gave the alarm when the flying columns alighted, and thither ran the strangely equipped army to gather their enemy by the bagful and bury them in trenches dug for the purpose. All availed naught; they might as well have tried to dip out the sea with a spoon. The locusts devastated the land for four months, causing fearful loss and misery.

Glancing through the most easily accessible records, we find that from the time of the Pharaohs to the present day locusts have devastated different parts of the world, nearly every country in Europe and Asia, also Australia, the Philippine Islands, Oceanica, Madagascar, all of Africa, many parts of South America, and portions of North America having been laid waste by them, often to a fearful extent.

Thus we read that in 1271 all the corn-fields of Milan were destroyed; in 1339 all those of Lombardy; in 1476 Poland was wasted; in 1478 so great a famine was caused by locusts in the Venetian territory that thirty thousand persons are reported to have perished; in 1650 they entered Russia in immense numbers in three different places, and passed over Poland and Lithuania, where the air was darkened by their numbers; in

many places they lay dead to the depth of four feet. Again they covered the surface of the earth so closely as to change its color; they loaded the trees, and destroyed everything before them. From 1744 to 1748 all Europe was laid waste by one of the most widespread and terrible invasions known to history, some stragglers even getting to England, while yet others crossed the Baltic and appeared in Sweden in 1749. From 1754 to 1757 Spain was the subject of a fearful visitation, when the ravenous insects, finding their natural food-supply exhausted, fell upon anything they could bite; entering the church of Almaden, they devoured the silk garments that adorned the images of the saints, even consuming the varnish on the altars. Indeed, in all countries the famished insects have added to their other exploits that of raiding the houses and consuming clothing and whatever else they could find.

Thus we might go on endlessly in the story of devastation, imagining we were reading an old-fashioned history of Europe where the slaughter of nations was the principal theme.

Looking to the East we find the story repeated. In the East Indies locusts have often caused such havoc as to compel the people to change their habitations, as has also happened in some parts of China, whose

chronicles show devastations from this source recurring from the remotest times. The Philippine Islands have borne their share of this strange and terrible burden. One man traveling in the island of Luzon in 1819 tells us that he was for hours protected from the sun's rays by a passing swarm, — a unique umbrella that fortunately is not opened over that devoted land every year, though it is reported that Luzon is victimized once in about every seven years.

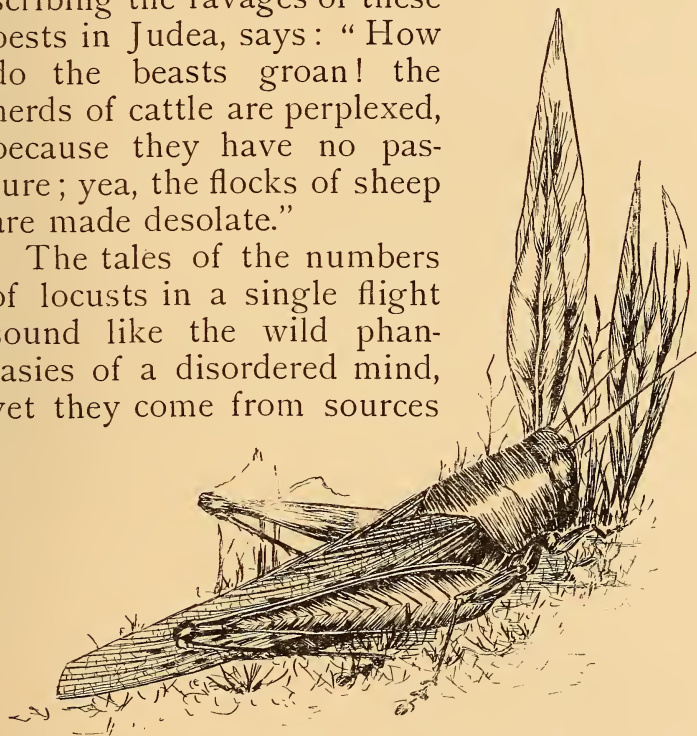
In 1824, and again in 1871, Australia was devoured by her own migrants, which, coming from the arid plains to the north, swept southward like a consuming fire. The continent of New Guinea has been ravaged again and again by incursions of foreign locusts, and often to such an extent that vast numbers of the natives have died from starvation and plague; while the misery in India from this cause almost or quite parallels that of Africa.

Nor are long and painful records wanting of visitations in our own country, where the suffering though sometimes extreme has never equalled that in less favored continents; for whatever we accomplish in the way of locust-raising at home, we are at least safe from the awful outpourings from Africa and Asia.

Wherever the locust appears, not only does

man suffer the loss of his grains and fruits, but also of his flocks and herds, which die of starvation. The whole world might lament in the words of the prophet Joel, who, describing the ravages of these pests in Judea, says: "How do the beasts groan! the herds of cattle are perplexed, because they have no pasture; yea, the flocks of sheep are made desolate."

The tales of the numbers of locusts in a single flight sound like the wild phantasies of a disordered mind, yet they come from sources



too reliable and too modern to bear dispute. Thus we learn that in India some fifty years ago the whole Mahratta territory was ravaged by a host supposed to have come from Arabia, of such incredible numbers that it extended over an area of five hundred square

miles, and was so dense as to hide the sun sufficiently to prevent any object from casting a shadow. In 1811 an incredible swarm visited India and the countries west of it. One traveller reports having ridden forty miles at right angles to the moving column before he got past it. This immense flight continued for three days and nights, and it was calculated that if the insects comprised in it could have been heaped up, they would have made a pile more than one thousand times the size of the largest pyramid of Egypt; or if laid on the ground close together, they would have encircled the globe in a band a mile and an eighth wide!

This swarm in the district Marwar caused such a famine that the natives fled in a body, pouring into Guzerat and Bombay, where it was estimated that out of every hundred, ninety-nine of them died that year. Near the town of Baroda the poor wretches died at the rate of five hundred a day; and at the town of Ahmedabad, out of two hundred thousand inhabitants, one hundred thousand died as a result of this awful visitation. Coming close to our own time, we learn that in November, 1889, a swarm two thousand square miles in area crossed the Red Sea.

Locusts do not fly in a dense mass like bees in a swarm, but allow space enough for the free motion of their wings; many

eye-witnesses have compared a flight of them to a snowstorm as the light touched their glancing wings. At a distance the swarm resembles a dark cloud in the sky. When they alight it is as the falling of snow, cover-



ing everything, often to the depth of several inches or even feet; and travellers have had the unenviable experience of being "snowed under" by a swarm of locusts suddenly descending upon them and their horses. The situation can be imagined when we realize

that an adverse wind may cause an unpremeditated descent of the insects, which sometimes pile up waist-deep over quite large areas; and the Tartars affirm, and it is easily believable, that people are sometimes suffocated by them.

A very graphic description of the rising and subsequent spreading out of a great swarm of locusts has been given by the naturalist Jaeger, who was an eye-witness to the phenomenon. He had been travelling in Asia with considerable difficulty because of the locusts that impeded his progress, and it was on an island in the Black Sea that he had what he calls a majestic view of a flying swarm. Some five miles ahead of him there arose perpendicularly from the ground several thick and solid columns, like the smoke of a volcano. At a height of about five hundred feet these spread out like heavy dark clouds, which soon covered the whole sky, entirely obscuring the light of the sun. These apparent clouds proved to be swarms of locusts, which in a short time descended to the ground with a shrill, whistling noise, covering an immense extent of country. In a few moments the land was stripped bare of the thick and luxuriant grass that had covered it, making it as barren as a turnpike.

Troops have been stayed on their march, as in the well-known instance of Charles XII,

King of Sweden, who, while retreating from Bessarabia in 1749, had his whole army brought to a standstill by the sudden descent of locusts upon them. Armies have been defeated, and in our day railway trains stopped, by this feeble folk whose strength is terrible because of their numbers.

The noise of their flight almost passes words to describe. The poet Southey thus attempts to do it justice :

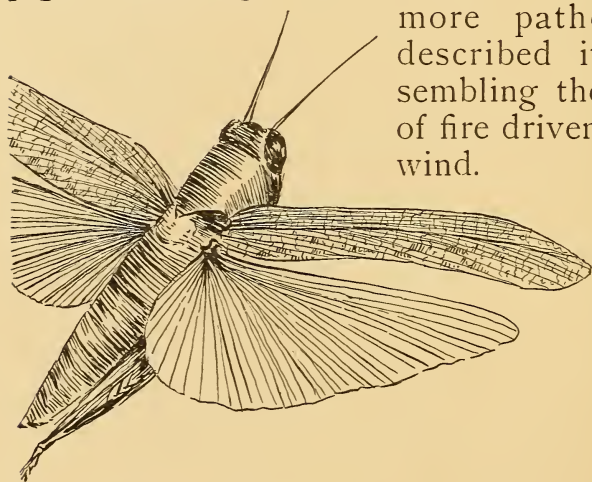
“Onward they came, a dark continuous cloud
Of congregated myriads numberless,
The rushing of whose wings was as the sound
Of a broad river headlong in its course
Plunged from a mountain summit, or the roar
Of a wild ocean in the autumn storm,
Shattering its billows on a shore of rocks !”

Others have compared the sound to that of a rushing railway train, or a whirlwind, or that made by the great grasshoppers of the Apocalypse, of whom it is written : “And the sound of their wings was as the sound of chariots of many horses running to battle.” The prophet Joel compares the sound of a flying swarm to the noise of chariots on the tops of mountains. And this noise is merely the rushing of myriads of wings through the air, as the migratory locusts do not sing during flight.

More terrifying to the stricken people than the sound of their flight is the dread sound

of their feeding, for where those ravenous mouths have browsed will remain no blade of green, no grain to harvest, no fruit to gather. Where they are present in such incredible numbers the sound of their eating is said to be distinctly audible; some one has likened it to the noise made by little pigs munching corn, while others have

more pathetically described it as resembling the sound of fire driven by the wind.



Those who have not witnessed a flight of locusts may like to read a description of one which Darwin met with in the Argentine Republic in 1853, the species which he describes being almost identical with the famous migratory locust of the East.

"They appeared as a ragged cloud of a dark reddish-brown color. For some time we had no doubt but that it was thick smoke proceeding from

some great fire on the plains. Soon afterwards we found it was a pest of locusts. The insects overtook us, as they were travelling northward, by the aid of a high breeze, at the rate, I should suppose, of ten or fifteen miles an hour. The main body filled the air from a height of twenty feet to that, as it appeared, of two or three thousand above the ground.

The noise of their approach was that of a strong breeze blowing through the rigging of a ship. The sky seen through the advance guard appeared like a mezzotint engraving, but the main body was impervious to sight. They were not, however, so thick but that they could escape from a stick moved backward and forward. When they alighted they were more numerous than the leaves in a field, and changed the green into a reddish color."

Fortunately, the migratory locust does not remain long in strange lands, though it often breeds successfully for three or four years in its new home; and so great is its fecundity that to exterminate it by finding and destroying the eggs is, excepting in very favorable localities, an almost hopeless task. This the people of a devastated district in Hungary discovered in the Spring of 1781, when, after disinterring and destroying millions of eggs, they yet found, when the hatching season arrived, many places in which the earth was covered with young locusts, so that not a single spot was left bare.

Where the insects have selected their breeding ground the eggs may often be ploughed

up in apparently solid masses over large areas. Egg-collecting is one of the methods employed by all peoples to abate the nuisance. In 1613, during an invasion into France, orders having been issued by the government for the collection of eggs, more than three thousand measures were taken, each measure containing something like two millions of eggs, the total being the pretty sum of six billions of eggs; and it is less than forty years ago that sixty-two tons of eggs were collected and destroyed in the Isle of Cyprus, representing something like fifty billions of locusts; while, if the reports can be trusted, in 1881 that island broke the record with thirteen hundred tons of these eggs! After this, the toll of eighty thousand sackfuls, collected in four days by the people of an infected district of Italy, seems moderate.

Very large sums of money have been expended by different governments in payment for the collection of locusts' eggs, as well as for that of the insects themselves. We can hardly wonder that a creature endowed with such terrific fecundity should plume itself occasionally upon its power in the world, as is told in an ancient Arabian legend of a locust that thus vaingloriously addressed Mohammed:

"We are the army of the great God, we produce ninety-and-nine eggs; if the hundred were

completed, we should consume the whole earth and all that is in it."

As a matter of fact, the migratory locust of the East does often produce the hundred, and even far exceeds that creditable limit; where he alights he consumes the earth and all that is in it, though fortunately not all of it at a time. It is but fitting that a foe of such importance should at times have been attacked in warlike manner, and many are the chronicles of winged hosts having been assaulted by the armies of the kings of earth.

The weapons so prized in shedding human blood, however, are powerless when turned against the hosts of the air, upon whose ranks they have not the slightest effect, darts of all kinds returning harmless to earth, while even gun shots and assaults by cannon merely divide the column for a brief moment, when it closes up again and sweeps on its course triumphant.

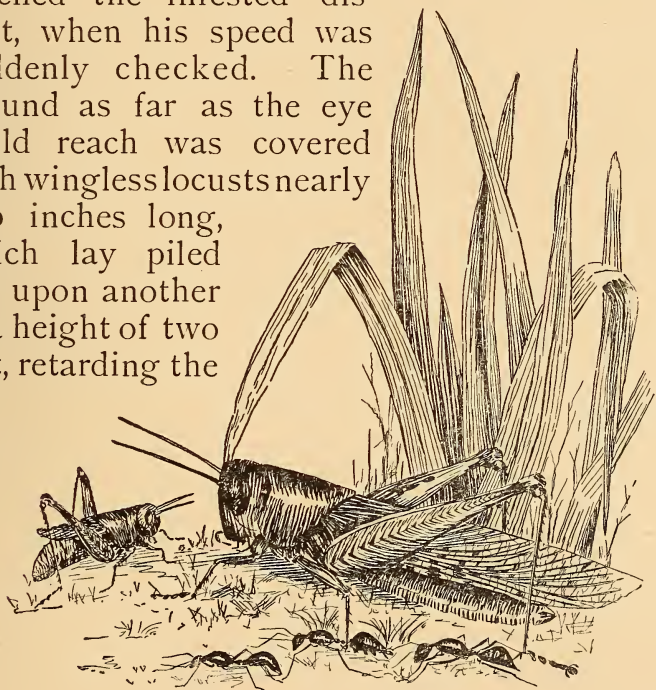
More sensibly, abandoning the useless methods of human warfare against an inhuman foe, the soldier has been armed with weapons less impressive yet better adapted to the tactics of the enemy. One can imagine the scene in certain parts of Spain when, the word having come that locusts had appeared, the gallant soldier boys were ordered out and divided into companies that

surrounded the infested district. Every man was furnished with a long broom, with which he went about thrashing at the ground and thus driving the young locusts toward a common centre, where was a great pit prepared to receive them, and where, having fallen in, they were mercilessly consumed by a fire of brushwood. Three thousand men, part peasants, part soldiers, were thus employed in 1780 for three weeks at Zamora, and the result of their raid exceeded ten thousand bushels of captured, condemned, and executed; while in 1783 four hundred bushels more were collected and destroyed in one day.

The government of Transylvania in 1780 ordered fifteen hundred persons to gather each a sackful of the locusts that appeared in alarming numbers in a certain district. The insects thus collected were destroyed, but with very little effect, so overwhelming were their numbers.

It was about fifty years later than this that the largest army of soldiers we have any record of was sent out against the locusts, and it is again the naturalist Jaeger who tells the story. It was in the month of April, 1825, when he was travelling post-haste from Moscow to Crimea, that he found the people in great distress of mind because of the incredible numbers of wingless locusts that had appeared upon certain desert prairies

between Kiew and Odessa, and in other parts of the Russian Empire. Well the people of the cultivated regions knew what would happen as soon as the ravenous hordes got their wings. The traveller in course of time reached the infested district, when his speed was suddenly checked. The ground as far as the eye could reach was covered with wingless locusts nearly two inches long, which lay piled one upon another to a height of two feet, retarding the



progress of the carriage, which dragged heavily as though being drawn through a deep mould. The horses could not even walk fast, much less trot, and the wheels were constantly covered from two to three inches deep with crushed locusts. This state of

things continued for a distance of about four hundred miles. One cannot wonder that the people were alarmed.

Against this incredible army of locusts the Emperor Alexander of Russia sent an army of thirty thousand soldiers, which presented literally "a broad front" — spreading out for several hundreds of miles. Advancing, armed with sacks and shovels, the brave soldiers fell upon the foe, capturing as many as they could and destroying them by fire. We are not surprised to learn that notwithstanding this onslaught enough locusts escaped to get their wings and lay waste large tracts of country.

In 1835 the locusts were so threatening in certain districts of China that the military were ordered out and a bounty was put on the captures made. Out went the picturesque community and fell to with such a will that the bounty was soon lowered. Then, strange as it may seem, the locust gatherers struck, proving that there is a wage limit below which even a Chinaman will not work. In this case the strike reflected doubly hard on the strikers, for the pygmy enemy ravaged their fields unmolested.

Every conceivable device has been tried against the invading hosts, which not even the highest mountains can stop, though at

least one range is reported to have proved a help to man in repelling the would-be invaders; for it is said that by building great fires on those points of the Atlas Mountains over which the locusts are known always to pass, and at the season when they are likely to appear, the Arabs warded off the scourge from all the countries north and west of this great range. The mountains being high, with snow-capped peaks, the insects became chilled in passing over, and, attracted by the glare of the fire, plunged recklessly into the flames. So long as the Sultan paid for the maintaining of these fires not a locust passed the mountain barrier, but when, finding his territories quite free from the scourge, he ceased taking what seemed a needless expense, that same year he was punished by the appearance of the locusts, which have laid waste his lands ever since.

Laws have been enacted from all time to compel the people to try to mitigate the curse of locusts; and Pliny says:

“In the Granaicke region within Barbarie, ordained it is by law, every three years to wage warre against them, and so to conquer them. Yea, and a grievous punishment lieth upon him that is negligent in this behalf, as if he were a traitor to his prince and country. Moreover, within the Island Lemnos there is a certain proportion and measure set down, how many and what quantity every man

shall kill; and they are to exhibit unto the magistrate a just and true account thereof, and namely, to show what measure full of dead locusts. . . . Moreover, in Syria they are forced to levie a warlike power of men against them, and to make riddance by that means."

As the law of peace prevails over all the earth it may come to pass that the army of the future will be organized against the locust alone. Going forth bravely, equipped with weapons that bear no resemblance to firearms, the valiant soldiers will return to answer to a roll-call in which no name shall be missing, no lives lost on the side of the besieged against millions slain on that of the besiegers,—an unequal contest in which the lack of military glory will be offset by human lives saved instead of destroyed.

XIII

WHENCE THEY COME AND WHITHER THEY GO

THE coming of the locust is a visitation as mysterious as it is terrible. To-day the land lies wreathed with vines, smiling with golden promise of fruits and grain, — to-morrow hundreds of square miles may lie black and wasted, with not so much as a blade of grass or a green leaf to show that Summer is here. The people, at one moment care-free and happy, the next mad with terror, leave their homes and, with their little ones about them, rush blindly away to find if possible before starvation stops them an uninfested district where they can get food enough to sustain life. On the other hand, the destroying swarm may leave as suddenly as it came; and it is this well-known habit to which the prophet Nahum refers when foretelling the destruction of the Assyrians:

“Thy crowned are as the locusts, and thy captains as the great grasshoppers, which camp in the hedges in the cold day; but when the sun ariseth they flee away, and their place is not known where they are.”

Having done their work of destruction, they occasionally disappear entirely, and years may elapse with no sign of them; then, without a moment's warning, the dread scourge falls upon the doomed fields like rain from heaven.

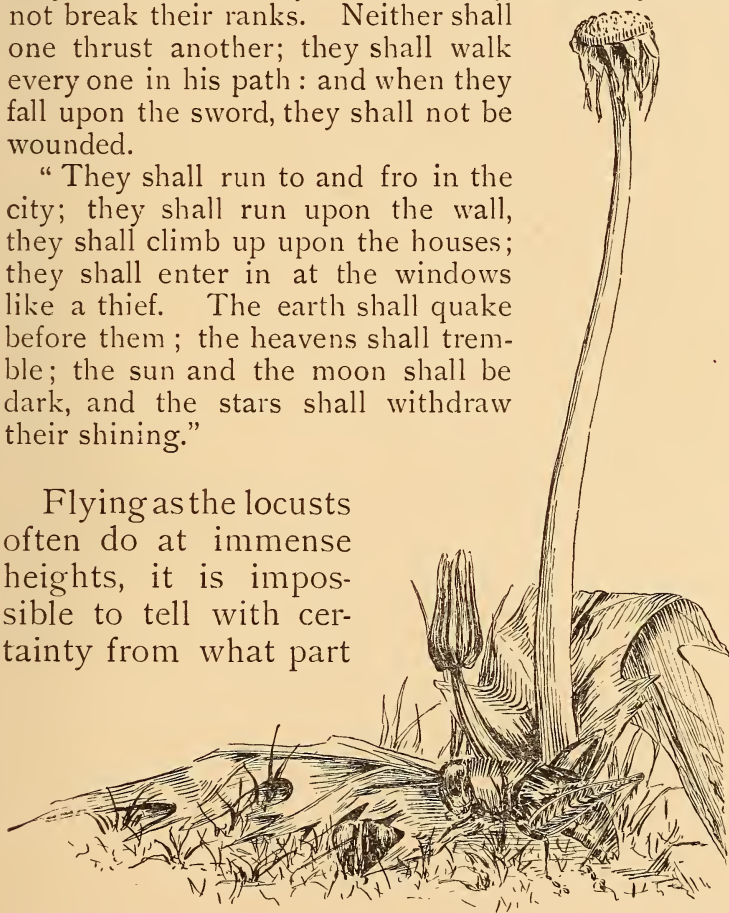
What wonder that from all time the appearance of the locusts has excited the minds of men as other great universal calamities have excited them? What wonder that the highest pitch of eloquence was reached in portraying the hordes that so grievously overran Egypt in Bible times? Nothing in all literature surpasses in simple grandeur the following description by the prophet Joel, where the locusts are depicted as strong warriors coming in mighty armies to lay waste the land:

“A day of darkness and of gloominess, a day of clouds and of thick darkness, as the morning spread upon the mountains: a great people and a strong; there hath not been ever the like, neither shall be any more after it, even to the years of many generations. A fire devoureth before them; and behind them a flame burneth; the land is as the Garden of Eden before them, and behind them a desolate wilderness; yea, and nothing shall escape them. The appearance of them is as the appearance of horses; and as horsemen, so shall they run. Like the noise of chariots on the tops of mountains shall they leap, like the noise of a flame of fire that devoureth the stubble; as a strong people set in battle array. Before their face the people shall be much pained: all faces

shall gather blackness. They shall run like mighty men; they shall climb the wall like men of war; and they shall march every one on his ways, and they shall not break their ranks. Neither shall one thrust another; they shall walk every one in his path: and when they fall upon the sword, they shall not be wounded.

“They shall run to and fro in the city; they shall run upon the wall, they shall climb up upon the houses; they shall enter in at the windows like a thief. The earth shall quake before them; the heavens shall tremble; the sun and the moon shall be dark, and the stars shall withdraw their shining.”

Flying as the locusts often do at immense heights, it is impossible to tell with certainty from what part



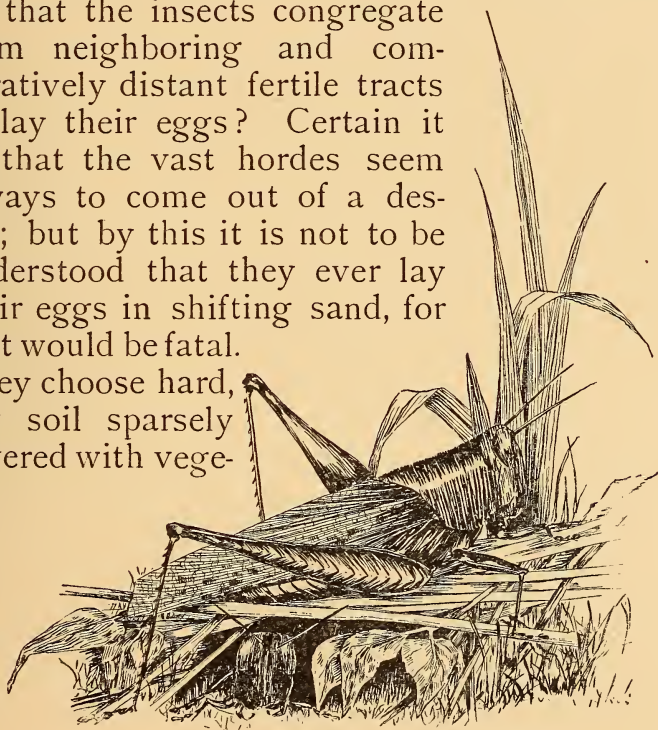
of the world they hail; for while they are generally seen at an elevation of from forty to four hundred feet, they not infrequently rise to five

hundred or eight hundred feet, or under certain circumstances even to two miles. High reddish clouds have been seen which when examined by the telescope proved to be nothing more nor less than a flight of locusts, bound who shall know whither, to lay waste what distant lands. And those watching with the telescope have seen swarms pass at a height which made them quite invisible to the inhabitants of the earth below. Even snow-clad mountains, as we have already had evidence, do not stop them. Once a large swarm was seen high above a peak of the Rocky Mountains, a peak that towered eight thousand five hundred feet above the plain below and fourteen thousand five hundred above the level of the sea, in a region of perpetual snow. At these enormous heights the locusts are doubtless borne along by upper air currents, as the wind always plays an important part in their long journeys.

Where do these hosts originate? That is a question which has often been asked. The interior of Africa, of Arabia, certain sterile parts of Asia, waste lands to the west of Brazil or in Bolivia, and the arid lands adjacent to the Rocky Mountains are known to send forth vast swarms of migrating locusts. Moreover, these sections are never entirely free from them, so that they may be looked upon as the permanent home of the species.

As to why the locusts migrate, the most probable explanation is that they do so only when they have multiplied so excessively at home that it is go or starve. Or, since the eggs succeed best in warm, dry soil, may it be that the insects congregate from neighboring and comparatively distant fertile tracts to lay their eggs? Certain it is that the vast hordes seem always to come out of a desert; but by this it is not to be understood that they ever lay their eggs in shifting sand, for that would be fatal.

They choose hard, dry soil sparsely covered with vege-



tation, and such they can find in abundance, either on the confines or in the interior parts of all the great deserts.

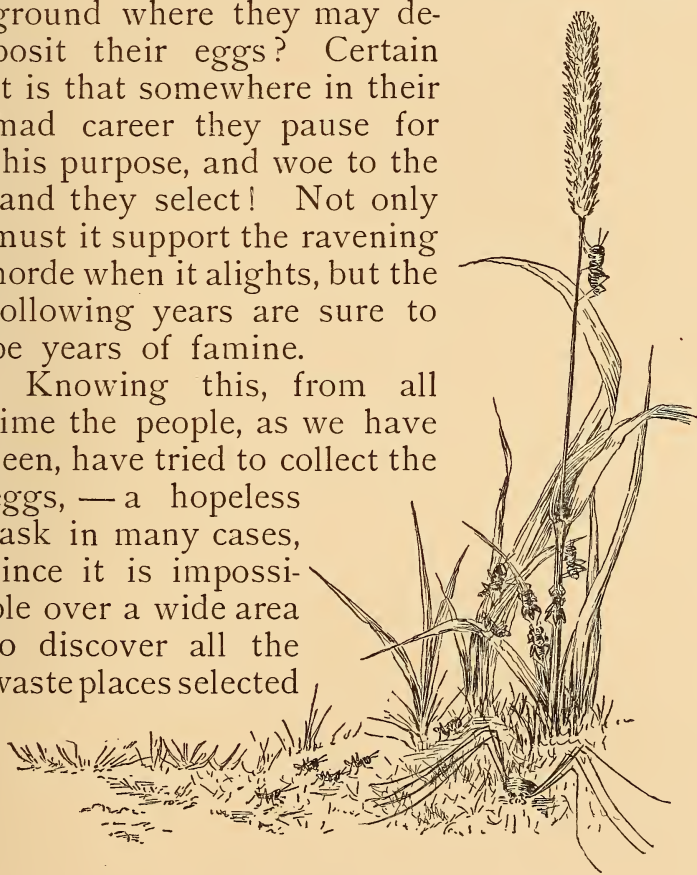
Where the enormous swarms spend their time before the wings have developed, and

whether the immense flights are a single community or made by the joining of several communities, are questions hard to answer. What we do know is that they cannot prosper many successive years away from home, and in nearly all cases of colonization, after from three to seven years the imported nuisance disappears, apparently from natural causes. The climate does not agree with them, or they or their eggs are attacked by disease or parasite, and the plague sometimes ceases almost as suddenly as it appeared ; too often, however, not until it has wrought terrible havoc in the stranger's land.

The flights of locusts, destructive as they often are, are less to be dreaded than the armies of young unfledged insects. The flying swarm often passes over a fertile region without alighting, perhaps being intoxicated with the streaming motion of their own immense numbers. Again, they may stay but a short time and eat little or sometimes even nothing at all, apparently merely resting in order to go on their strange way again. At other times, being hungry, they may destroy vast regions before they finally take to wing. In yet other cases they alight and deposit their eggs ; and may it not be that these immense swarms, following the instinct of all creatures to provide for their young, and realizing the desperate state of

affairs at home, are winging their way over the face of the earth in search of a well-provisioned land and a suitable hatching-ground where they may deposit their eggs? Certain it is that somewhere in their mad career they pause for this purpose, and woe to the land they select! Not only must it support the ravening horde when it alights, but the following years are sure to be years of famine.

Knowing this, from all time the people, as we have seen, have tried to collect the eggs, — a hopeless task in many cases, since it is impossible over a wide area to discover all the waste places selected



for egg-laying purposes. The gregarious instinct, which is what makes the locust so dangerous, causes the females to congregate in one place for oviposition; and often the

holes are bored so close together that the nests, as they are called, touch each other, thus making what is practically a solid mass of eggs, which sometimes covers large areas.

Coming out of the nesting-ground, the young insect is a most insignificant and comical-looking affair, or would be if the terrified beholder could forget the meaning of those pale and wriggling mites which even at that tender age cover the ground upon which they rest and which will soon grow dark-colored and firm on their legs.

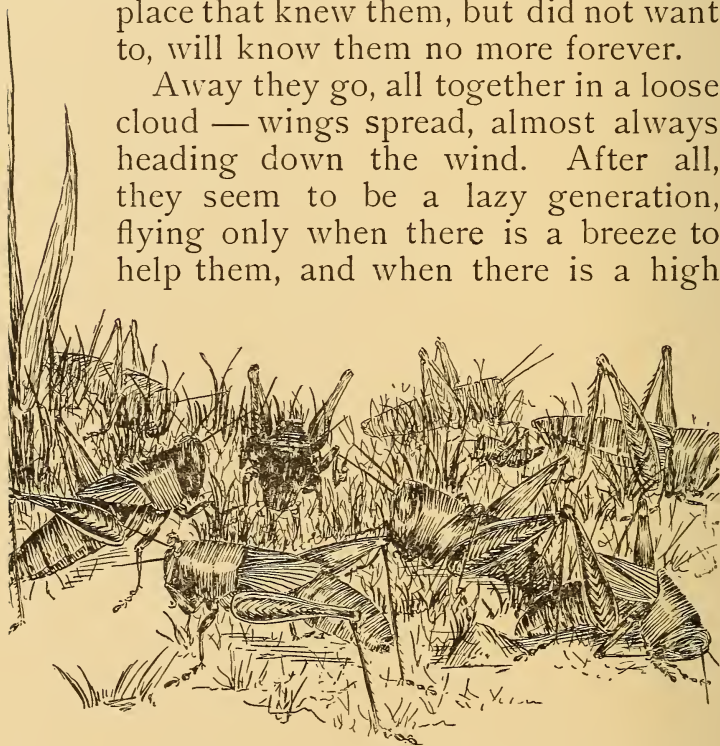
The young locust eats what is within reach until after the first skin is shed, when, if food is abundant, it will linger around its nursery for some days or even until after the second or third moulting. Then it grows restless; perhaps its instinct informs it that this foreign land is not its true home, that its race cannot thrive here indefinitely; and one day, by common consent, the whole congregation of infants takes up the march. Millions, billions strong these Voetgangers, as the Dutch of South Africa call them, walk along, head erect, eyes fixed. On they march in one undeviating course, an admirable and pretty sight—if again one could forget. Their great business in life now is to eat, and on they march remorseless as death. It is impossible to turn one of these absurd armies by any kind of force, though the lamentable

babies can be coaxed to follow sometimes, by the judicious waving of bright flags. If force be used, they easily become confused and discouraged, and hop wildly in all directions, but eventually settle down and walk on in exactly the path they first chose. No man can stop them, and no man can turn them, unless they allow themselves to be cajoled into a new course; but they often voluntarily change for reasons unknown to us. Yet sometimes so insensate is their determination not to turn their direction that they plunge into streams of water, which they can swim if not too wide, though usually such a catastrophe results in the loss of many unlamented lives.

As they go they devour the earth beneath them, swarm over every bush, and climb every tree, until not a green thing is left, and the place behind them looks as though a fire had passed over it. Eating thus, they grow fast and eat ever more voraciously. They advance more or less rapidly according to the obstructions to be surmounted, where the way is clear covering a distance of two miles a day, otherwise making slow progress, perhaps not going over half a mile in their day's journey. Generally they stop at night, and if it is cold they pile up together to keep warm; on warm nights they may pass the pleasant hours in uninterrupted gormandizing.

Finally, after a period of seven or eight weeks, the wingless hosts pass their last moult, find themselves full-fledged, feel the desire of the new wings—and then, the place that knew them, but did not want to, will know them no more forever.

Away they go, all together in a loose cloud — wings spread, almost always heading down the wind. After all, they seem to be a lazy generation, flying only when there is a breeze to help them, and when there is a high



wind trimming their sails, and taking no further concern in the matter. For at such times they may be seen faced against the wind, wings spread, drifting backward on the aerial current. In this lazy way they often make a pleasant trip of twenty miles in a day.

It will occur to every one that the time to intercept the high-handed doings of the locust is in the walking stage, but whoever watches for the first time one of these armies on the march will have the same feeling of helplessness before them that he would have if put on the seashore and requested to prevent the sand from drifting in when the wind blows. Yet this is the time of all times to get the upper hand. If they are infesting a district of low shrubs or scrub, a running fire will humble their pride; if they are on open pasture, herds of cattle, sheep, and horses may be stampeded back and forth until they have trampled them to death; or they may be mercilessly and fatally flattened under great rollers drawn by horses over the ground. Again, troops of farmers or soldiers may be called into requisition, armed with the various implements recently devised for collecting them wholesale. Where they are marching in vast numbers, the whole army may sometimes be captured by an ingenious device that works miracles under the right conditions — concerning which more presently.

While in most cases the migratory locust dies out after a few years' occupation of a foreign home, it sometimes happens that a swarm may find a place so well suited to its needs that it takes out papers of naturalization, so to speak; then the land of its

visitation becomes its permanent home, from which it can be dislodged only by the most persistent and heroic efforts.

Such is the beautiful Isle of Cyprus, whose history from all time has been closely interwoven with that of the migratory locust. Crossing over from the Caramanian Mountains of Turkey, the swarms not only devastated the island for the moment, but finding a favorable breeding-place in its eastern tablelands, took up permanent abode there, whence they sallied forth on foraging expeditions every season, until routed by the outraged inhabitants.

So terrible were the visitations from 1411 to 1413 that, as we learn from the old chronicles, every tree in the country was perfectly leafless. But at a later date this was not the only sorrow brought by the scourge. Probably no insect has so distinguished itself in the political life of a country as has this locust of Cyprus. Adding moral injury to physical, it has lent itself to be the wicked tool of a corrupt government. Owned by all the dominant nations of the world, — Phœnicians, Greeks, Egyptians, Persians, Arabians, Romans, one after another, — Cyprus was conquered by the Crusaders in 1171, under Richard I, and by them retained for three centuries. Then Venice acquired it, and in 1571 it fell under the Turkish yoke, which

was its death-knell. For until that time, in spite of recurring ravages from locusts, it was a happy, thriving, and beautiful land; thereafter, for more than two hundred and fifty years, it lay a desolate wilderness. Its population melted away; its flourishing villages became mere names, only mounds existing to show where once the homes of the natives had stood; its forests disappeared; its fertile acres became waste land. Such people as remained were reduced to a condition of most abject poverty, excepting a few large landholders who could protect themselves more or less successfully from the inroads of the locusts, which were the ostensible cause of the reigning desolation.

The real cause, however, was a corrupt government, those in power refusing to do anything to abate the plague. They were able to live comfortably at the expense of the people, who collected locusts as a means of subsistence, the amount paid for this useless work after sifting through the hands of the government officials barely sufficing to keep the workers alive. The years from 1800 to 1860 were particularly trying to the starving natives, who at times had no other food than the bulbs of the squill.

The action of the Turkish government is the more inexcusable because a method for destroying the locusts was discovered by

Count Mattei, a rich landowner, and declined with no better reason than that, if the egg-collecting system were stopped, a few high in power would be deprived of their gains!

Under the circumstances the island was worthless to the Turkish Empire, and was finally ceded to Great Britain, when, after its long period of darkness, the sun rose again on lovely Cyprus. Not only were the eggs now collected with unheard-of thoroughness, but when the armies of young locusts began to march one Spring the plan of Count Mattei for capturing them *in toto* was successfully carried out.

Count Mattei, having noticed that the *saltonas*, or hoppers, as the wingless young were called, could climb the wall thirty feet high that surrounded his residence, experimented by making a perfectly smooth border of cement a few inches wide around it, which proved an effectual barrier to their progress. Fortunately for Cyprus, the foot-pads of the tormentor were defective, and this saved the country.

Count Mattei's simple device, refused a trial by the Turkish government, was adopted under the British in 1883. The walls of the villages were made perfectly smooth for a short distance above the ground. Where there were no walls, screens about a yard high were made of calico stretched tight,

with three inches of smooth oilcloth fastened to the upper margin on the side facing the coming army. Three hundred and eighteen miles of these cloth screens faced the advancing foe. At short intervals pits were dug, surrounded by a band of tin that projected some three inches over the opening, the other edge being held down and covered with earth. Of these there were sixty-five thousand.

One can imagine the appearance of the country and the excitement of the people. On came the armies, marching, marching, as numberless as the sands of the seashore. Behind them black devastation; before them the green crops of the people; and between — the apparently meaningless cloth walls.

The first one was reached. The lower edges of all of them were covered with earth to prevent the hoppers from going under. The advance guard promptly walked up the obstruction. All went well until the smooth oilcloth was reached; then the climbers could not go on. Those behind pressed forward; the leaders lost their footing and fell to the ground! Presently there was a windrow of struggling insects, many of which in trying to escape, fell into the pits and could not get out because of the smooth, projecting tin. Now the ready enemy charged upon the bewildered intruders with brooms and shovels, quickly filling the pits and

destroying the terrified prisoners as fast as possible.

Thus perished fifty-five thousand pitfuls, about one hundred and ninety-five billions of locusts in one season.

The whole population were called into requisition, not only to attend the pits, but to wage war wherever a locust was to be seen. Trees and bushes covered with them were set on fire; places unsuited to the use of the fences and ditches were cleared by hand; the districts where the eggs were laid were ploughed up, horses, oxen, every instrument that could be of use was drafted into the service in that famous campaign.

In one single year British enterprise and honesty stamped out the scourge that had made of Cyprus a wilderness for two centuries and a half. Since then there have never been enough locusts to make recourse to the fence-and-ditch method necessary, such as appear being readily kept in check by simple gathering, and Cyprus once more graces with her old charm the lovely southern sea.

XIV

LOCUSTS AS FOOD

FEARED and hated as the locusts are in so many parts of the world, it is refreshing to turn another leaf in their history and find them, not exactly the darling of nations, but at least eagerly looked for and joyously welcomed when they come. In some places, even where they devour every green thing, they are received with demonstrations of excessive joy, and there is no doubt that the conjurors from the beginning of time have invoked their coming.

The reason for this apparent inconsistency if not romantic is at least comprehensible—the eater becomes the eaten. For be it known that the fat and well-fed locust is himself a delicious tidbit in some discriminating parts of the world. The Arabs have always been fond of locusts, eating them as a delicacy even when they had other food, and in most of the Oriental countries they are more or less highly esteemed. Indeed, they sometimes become the chief article of diet, while it is said that in some places they are

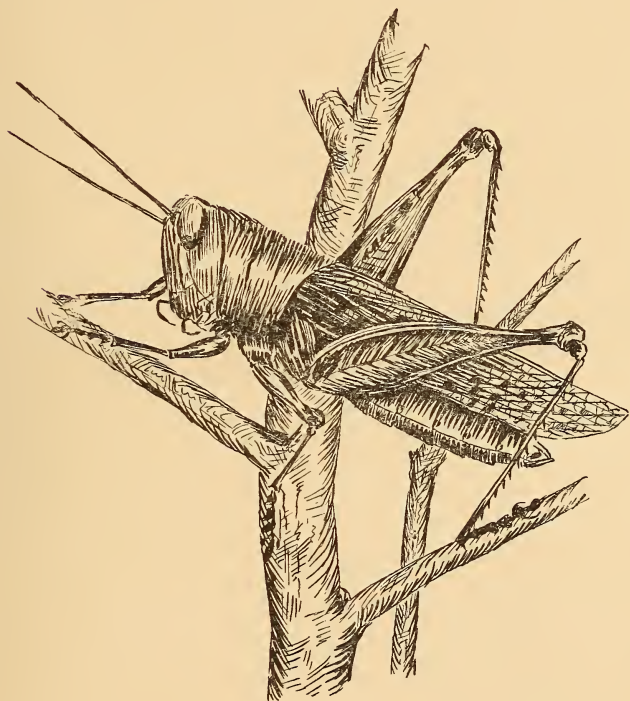
the permanent reliance of the people — being to them what bread is to the European.

Africa is a locust-eating continent, so far as the native populace are concerned, and if we will but think of the matter fairly, there is no more objection to eating good vegetable-fed locusts than shrimps or lobsters or oysters, or that highly esteemed delicacy of epicures, the soft-shelled crab. As we do not eat the legs of crabs, neither do those others eat the legs or wings of the locusts; these are thrown aside, only the succulent body being retained,— a costly tidbit if it were as much trouble to catch a locust as to catch a crab; but as it is, they form the abundant and untaxed bread of the people.

Locusts are always eaten cooked, and there are various ways of preparing them, all more or less simple. In Barbary the usual way is to boil them half an hour; remove head, wings, and legs; sprinkle the rest with salt; and fry, adding a little vinegar. This dish is so relished that it is even served at times when there is abundance of other food, and we are told that one may eat a plateful of these delicacies, to the number of two or three hundred, without experiencing any ill effect. We are also informed that the epicurean Moor prefers them to pigeons, finding them more stimulating.

Such luxury as this, however, is quite

beyond the poor Bedouin of the desert, who often welcomes a flight of locusts as a means of saving him from starvation. He catches his locusts in bags and pours them alive



into a pit heated for the purpose, just such a pit as every woodsman knows how to dig and heat for cooking beans or other forest fare in our own country. Once in, the locusts are covered with sand, a fire is built above them, and they are thoroughly roasted. After they have cooled, they are taken out and

spread upon tent cloths or blankets, and put in the sun to dry. This takes two or three days, during which they have to be carefully watched to save them from being consumed by their cannibalistic brothers, in case another flight should appear upon the scene. When they are thoroughly dry, they are pounded slightly, and put into bags or skins to be kept until needed. When about to be eaten, they are ground in mortars and mixed with water into a thick paste. It is not necessary to make these latter preparations, however, as the locusts are relished dry, the legs, wings, and head being first broken off.

Many times the natives of Northern Africa catch them in large numbers and throw them alive into boiling oil, where they remain hissing and frying until their wings are burned off and their bodies thoroughly cooked, when they are taken out and eaten. An observer tells us that they resemble in consistency and flavor the yolks of hard-boiled hen's eggs; others compare the flavor of the cooked locusts to that of prawns.

Another way to prepare locusts as a table delicacy is to pound them and boil them in milk. The more prosperous Arab eats his fried locusts for breakfast, spread over unleavened bread and mixed with butter.

In Central Africa a traveller saw whole calabashes filled with roasted locusts, which

sometimes form a large part of the native diet, particularly after the grain has been destroyed by the pests. We can imagine the added relish given to this dish spiced by revenge.

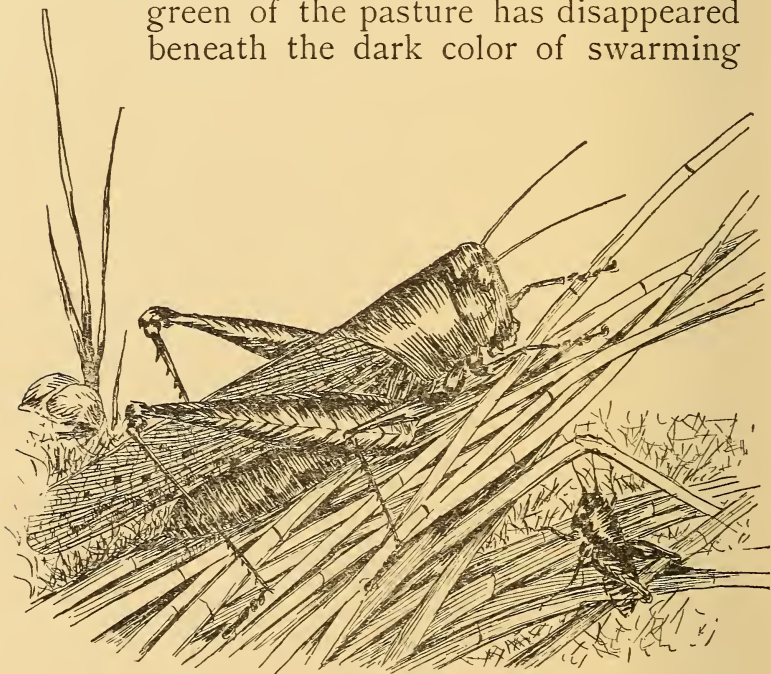
The Hottentots are among those who rejoice when the locusts come, for though they destroy every green thing, they constitute a delicious morsel. They are so greedily eaten that in a few days the gormands grow visibly fatter and better conditioned, and in years of scarcity the rain-doctors undertake to bring a supply of the favorite food by means of incantations. As soon as locusts are reported the natives hasten to the spot, sometimes going quite long distances, and often taking pack oxen to carry back the spoil.

The insects are boiled or steamed, and then dried in the sun and winnowed something like corn, to separate them from the legs and wings. When quite dry, they are stored away in sacks or laid in piles on the house floor. The natives eat them as they are, with salt if they can get it, or else they pound them in wooden mortars and mix the locust meal thus produced with water into a "cold stirabout."

The Bushmen also grind their dried locusts between two stones into a coarse meal, which they mix with fat and grease and bake into cakes. Upon this stimulating

bread we are told they live for months together; and they chatter with the greatest joy as soon as the locusts are seen approaching.

Boiled locusts make good food for cattle as well as for humankind; and when the green of the pasture has disappeared beneath the dark color of swarming



millions, the locusts themselves are sometimes substituted for the pasturage they destroy, being cooked and fed to the cattle, which willingly take their grass in this form.

With locusts as with other foods, some brands are more highly esteemed than others,

and it is a great compensation that the devastating migratory locust is a prime favorite, being large, fat, well-flavored, — to the connoisseur, — and causing no ill effects.

Some other species also are eaten, but there are some that must be avoided because of certain disorders which they induce. The female locust is the most highly esteemed, as it is considerably larger and plumper than the male; like the shad, it is best just before the egg-laying has begun. The moment to take it is immediately before the last moult, when it is at its best and most succulent stage, the wings being as yet undeveloped and useless for flying. This of course limits its use to that season, and where the people depend upon flights of locusts they gladly take what comes. Where the immature females can be obtained, the brown coffee-colored soup into which the Hottentots convert them is so rich in fat that it has a greasy appearance when cool and makes a rich feast for the fortunate possessors.

In Arabia and Africa vast quantities of locusts are cooked and dried for transportation, being spread on the roofs of the houses and wherever space is found, as macaroni is spread in Italy, and sliced apples used to be in our good old New England days. Mules heavily laden with bags of dried locusts have been seen making their way to the towns of

Tripoli. Ships, too, are loaded with dried or smoked locusts for transportation to less favored lands, and in the East one can order locusts for dessert in the *café* if he wishes to close his meal with a special delicacy.

In Persia and Arabia roasted locusts are sold in the markets and eaten with rice and dates, being sometimes flavored with salt and spices. At the present time we can buy roast locusts in the streets of Bagdad, that most delectable town that to some of us seems to exist only in the Arabian Nights, and where, if anywhere, we could relish the thought of locusts and pomegranates for dinner.

That locusts have been eaten in Arabia from the remotest antiquity is most delightfully proved by the sculptured slabs found by Layard at Kouyunjik, where the preparations for a gorgeous banquet are pictured. A procession of stately attendants preceded by mace-bearers marches along with clusters of ripe dates, baskets of pomegranates, apples, bunches of grapes, and vases of flowers, as well as cakes, hares, partridges, and all the other good things of the feast. Among them one attendant, and by no means the least stately, holds carefully before him long rods upon which are fastened rows of dried locusts, evidently regarded as a delicacy by even the proud Assyrian.¹

¹ See frontispiece of this volume.

China, of course, has not overlooked so obvious a remedy for hunger in her immense population, — at least in Tientsin bushels of fried locusts are hawked about the streets in baskets borne by boys. In India, as one would expect, curried locusts are the thing. It is also reported from the Philippine Islands that locusts are eaten as a regular food, the people catching them in nets when they come to feast on their potato vines. They are parched over the fire in earthen pans, which causes the legs and wings to fall off and turns the heads and backs red, like boiled shrimps. Indeed, cooking the locust seems to have this effect on its coloring, as it does on our own lobsters and crabs.

Although locusts are so generally and generously used as an article of food in some parts of the world, an exclusive diet of them is not wholesome, causing the consumers to become emaciated and melancholy. Diodorus Siculus, who lived about 60 B. C., gives us a detailed account of the locust-eaters of Ethiopia. These acridophagi, he tells us, are small of stature, very lean and meagre, and exceedingly black. They harvest their year's supply of food in the Springtime, when the south winds rise and blow great swarms of locusts out of the desert, very big and with dirty-brown wings. These evidently are the common migratory locusts, and they are

gathered wholesale, as would be necessary for a year's supply of food. In this locust-eater's paradise nature has supplied a long and deep vale which it is only necessary to fill with wood and other combustibles — and wait for the quarry to appear. The friendly winds never fail to drive in immense swarms, and as they come the brave hunters light the piles of fuel, and the locusts, suffocated by the smoke, fall into the fire. Days of wholesale destruction continue, until the ground is covered with heaps of the slain, which are finally collected and "salted down," the accommodating land abounding in salt, which we are gravely informed gives the locusts an excellent relish and preserves them a long time, so that the people have food of this nature all the year round. A most lazy life is this; but it has its reverse side, for we are told that these inordinate locust-eaters die young, being carried off by a terrible disease. This disease is as fabulous as perhaps is the whole tale of the acridophagi, though no doubt locusts do furnish the staple of life to many poor tribes for at least a part of the year; and Pliny informs us that "the people of the Eastern countries make their food of grasshoppers, even the very Parthians, who otherwise abound in wealth."

That the habit of locust-eating has not

been confined to the far East the following translation specifying a poor Athenian family's provisions goes to show :

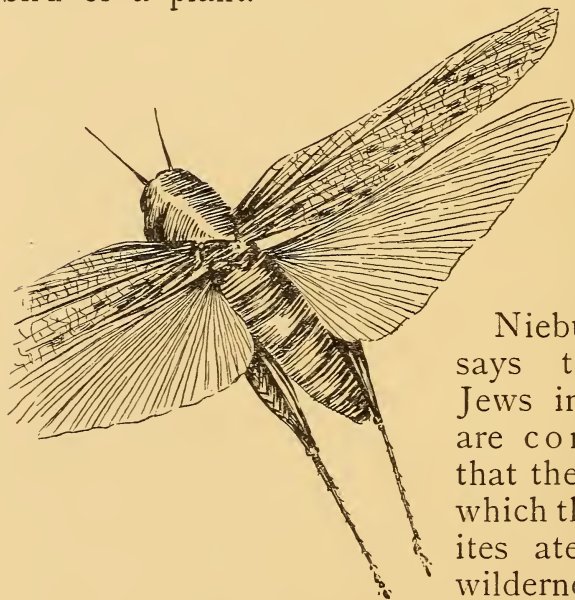
“For our best and daintiest cheer,
Through the bright half of the year,
Is but acorns, onions, peas,
Okras, lupines, radishes,
Vetches, wild pears nine or ten,
With a locust now and then.”

The “locust now and then ” must have been the occasional delicacy, as it would scarcely be regarded as a hardship. The most polished of the Greeks enjoyed them, the young unfledged insect being considered a dainty morsel.

When one becomes accustomed to the thought that vast multitudes of human beings eat locusts, even depending upon them for subsistence, it will not seem strange that these, with wild honey, were the food of John the Baptist in the wilderness ; for he was in a locust-eating country, where the insect was a common and easily transported food. The locust is among the creatures mentioned in the Bible as forming permissible food for the people: “Even these of them ye may eat: the locust after his kind, and the bald locust after his kind, and the beetle after his kind, and the grasshopper after his kind.”

Some Occidental writers contend that the locusts eaten by John the Baptist were the

bean of the carob tree ; while Hasselquist tells us he was assured by a judicious Greek priest that their church had never taken the word in any other sense than as the insect ; he even laughed at the idea of its being a bird or a plant.



Niebuhr also says that the Jews in Arabia are convinced that the fowls of which the Israelites ate in the wilderness were only clouds of locusts, and they laugh at our translators, who supposed that they found quails where quails never were.

Nor has the New World neglected the toothsome insect, which sometimes appears in South America in swarms that would do credit to Africa itself. The Indians of Chile, where the locusts are obtainable in great abundance, make them into a sort of bread,

we are told. The people — so the chronicle runs — watch for the coming of the locust, and when, as is the habit of the insect, it goes to rest in thickets that are scattered over the plains, the wily Indian steals up and fires the bushes, which the high winds speedily reduce to ashes. Then he gathers up his locusts already roasted, and has only to grind them into flour from which to bake his locust bread.

Coming closer home, we find that our own West Indies did not fail to discover the virtue of locusts as food, as we are faithfully informed by Peter Martyr in his "History of the West Indies." He says:

"Fernandus Oniedus declareth furthermore that in a certain region called Zenu, lying four score and tenne miles from Darrina Eastwarde, they exercise a strange kinde of marchaundize: For in the houses of the inhabitantes they found great chests and baskets, made of twigges and leaves of certaine trees apt for that purpose, being al ful of Grasshoppers, Grilles, Crabbes, Crefishes, Snails also, and Locustes, which destroye the fields of corne, all well dried and salted. Being demanded why they reserved such a multitude of these beastes: they answered that they kept them to be sowled to the borderors, which dwell further within the lande, and that for the exchange of these pretious birdes, and salted fishes, they received of them certayne straunge thinges, wherein partly they take pleasure, and partly use them for the necessarie affaires."

Locusts served up in such quaint language acquire a romantic flavor that makes one quite long to sample these "pretious birdes."

Coming yet closer home, we find in our own country customs which go to prove how universally known and used is anything good the world over and in all time. Just listen to what the "Empire County Argus" has to say about the locust-eaters of the United States:

"Among the choice delicacies with which the California Digger Indians regale themselves during the summer season is the Grasshopper roast. Having been an eye-witness to the preparation and discussion of one of their feasts of Grasshoppers, we can describe it truthfully. There are districts of California, as well as portions of the plains between Sierra Nevada and the Rocky Mountains, that literally swarm with Grasshoppers, and in such astonishing numbers that a man cannot put his foot to the ground, while walking there, without crushing great numbers. To the Indian they are a great delicacy, and are caught and cooked in the following manner: A piece of ground is sought where they most abound, in the centre of which an excavation is made, large and deep enough to prevent the insect from hopping out when once in. The entire party of Diggers, old and young, male and female, then surround as much of the adjoining grounds as they can, and each with a green bough in hand, whipping and thrashing on every side, gradually approach the centre, driving the insects

before them in countless multitudes, till at last all, or nearly all, are secured in the pit. In the meantime smaller excavations are made, answering the purpose of ovens, in which fires are kindled and kept up till the surrounding earth, for a short distance, becomes sufficiently heated, together with a flat stone, large enough to cover the oven. The Grasshoppers are now taken in coarse bags, and, after being thoroughly soaked in salt water for a few moments, are emptied into the oven and closed in. Ten or fifteen minutes suffice to roast them, when they are taken out and eaten without further preparation, and with much apparent relish, or, as is sometimes the case, reduced to powder and made into soup. And having from curiosity tasted, not of the soup, but of the roast, really, if one could divest himself of the idea of eating an insect as we do an oyster or shrimp, without other preparation than simple roasting, they would not be considered very bad eating, even by more refined epicures than the Digger Indians."

Surely there must be something inherently delectable in the locust that is thus relished in all parts of the world. May it not be that our strained sensibilities, enabling us as they do to swallow an oyster but causing us to shudder at the thought of a grasshopper, are depriving us of a great epicurean pleasure? Who knows but that some "health food" expert has already discovered in the toothsome locust the greatest aid to longevity yet exploited, and that we are about to read painted in large and convincing letters over

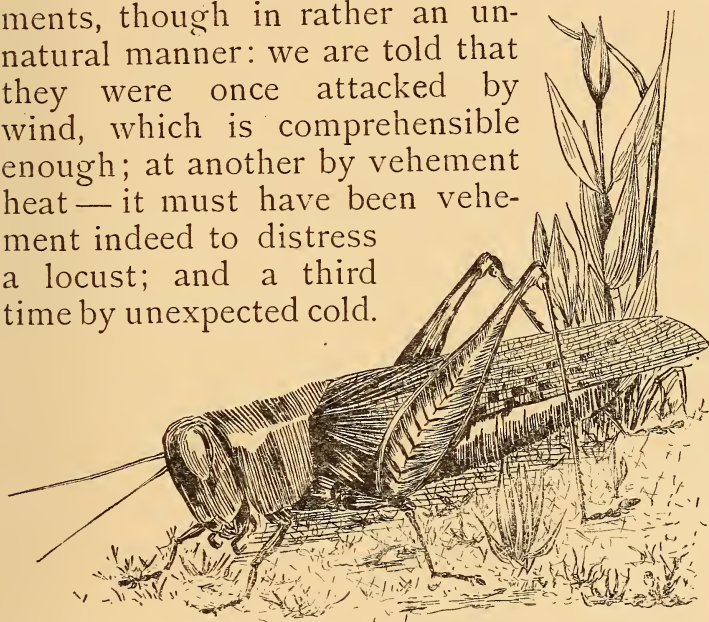
all New England's choicest landscape the thrilling legend "U-nee-da-grasshopper"?

A step in this direction was taken some years ago by the State entomologist of Missouri, who, being in a position to acquire abundance of fresh material, invited his brother entomologists to a feast of locusts. The insects were prepared in many ways, and, if report be true, were greatly relished by the fortunate banqueters. This good example does not seem to have been followed; at least, locust dishes do not occur with any frequency in our many new cook-books. Perhaps there is a good time coming.

Naturally the locust has been from all time an object of superstition, yielding willing obedience to the angry gods, who, to punish erring man, sent clouds of these insects to destroy his sustenance. Over and over again has ancient Rome, fearing a great famine because of swarms of locusts appearing from the coasts of Africa, been forced to consult the Sibyl's books to discover by what means the anger of the gods could be averted.

Pausanias tells us of a bronze statue of Apollo in the Parthenon which was called *Parnopius*, and made by Phidias out of gratitude to Apollo for having once banished the locusts from Greece, where they were greatly injuring the land. Pausanias

himself knew of three instances in which the god of the sun destroyed the locusts in Mount Lipylus, using quite natural instruments, though in rather an unnatural manner: we are told that they were once attacked by wind, which is comprehensible enough; at another by vehement heat — it must have been vehement indeed to distress a locust; and a third time by unexpected cold.



Every one will recall the punishment accorded to Pharaoh by divine wrath, as related in the Bible:

“If thou refuse to let my people go, behold, tomorrow will I bring the locusts into thy coast: and they shall cover the face of the earth, that one cannot be able to see the earth: and they shall eat the residue of that which is escaped, which remaineth unto you from the hail, and shall eat every tree which groweth for you out of the field. And they

shall fill thy houses, and the houses of all thy servants, and the houses of all the Egyptians."

The threat was presently executed, natural means being used to call forth and finally to banish the plague:

"And the Lord brought an east wind upon the land all that day, and all that night; and when it was morning the east wind brought the locusts. And the locusts went up over all the land of Egypt, and rested in all the coasts of Egypt: very grievous were they; . . . for they covered the face of the whole earth, so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees which the hail had left: and there remained not any green thing in the trees, or in the herbs of the field, through all the land of Egypt. . . . And the Lord turned a mighty strong west wind, which took away the locusts, and cast them into the Red Sea; there remained not one locust in all the coasts of Egypt."

In our own time it is the baneful influence of a comet that precipitates hordes of locusts upon long-suffering Egypt, as was the popular idea in 1843, when the land was ravaged; and the evil comet that sent the plague was seen for twelve days in the southwest. It is a popular superstition in Eastern countries that to dream of the coming of locusts is a sign of an approaching army, and that so far as the dream-locusts harm the land so will the army of men lay

it waste. The diviners foretold from watching the direction taken by a flight of locusts what kingdom was doomed to bow under divine wrath; they also decided, from the color of the insects, the national uniform of such armies as were to go forth to conquer.

Most of the efforts of superstition, however, were very naturally directed toward a remedy, or means of diverting the threatened visitation; and, as one would expect, the advice given on the subject is as wise as it is effective, Democritus advising that when a cloud of locusts is seen passing over a place all persons should remain very quietly indoors. If the visitors arrive suddenly, however, they will do no harm if you boil bitter lupines and wild cucumber in brine and sprinkle it about, — a practice which causes them to die.

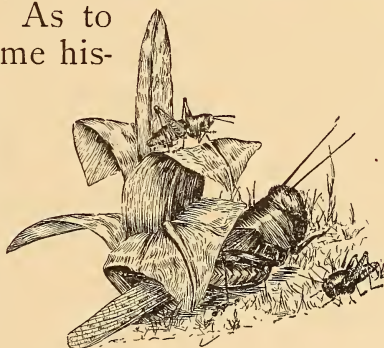
Again, you need only tie some bats to the tops of high trees to prevent the locusts from troubling you. One should think it might be a little wearing to keep bats in stock for the purpose, as well as to attach them at the right moment to the tops of high trees; but of course plebeian, practical considerations never troubled theorists in any age. More easily, and doubtless just as effectively, you can catch some locusts and burn them, thus rendering the others torpid. Otherwise, you may pound some absinthe, or

a leek, or centaury, with water and sprinkle it over the garden, when the fastidious locusts will satisfy the cravings of hunger elsewhere. Having grapevines in danger, it is only necessary to set three grains of mustard around the vine close to the root.

In China the people drive them into the sea or cause them to fall into some river, by marching out with colors flying and shouting and hallooing until the sensitive locusts, doubtless preferring death to any further Chinese demonstrations, throw themselves into the water. And in that mysterious land the power of reason has been successfully employed: we are told that at a time of great stress the Emperor went out into his gardens and, taking up some of the destroying insects, solemnly harangued them, informing them finally that they had better devour his bowels than the food of his subjects; and he emphasized his remarks by politely swallowing them. Whether they accepted the sacrificial challenge is not stated; probably not, since the Emperor's magnanimity appealed so powerfully to their feelings that the rest of the noble insects, at once and every one, took flight. It might not be gracious to wonder if fear of a like fate may have had anything to do with their hasty departure.

The superstitious Tartars of Crimea, finding

the locusts unmanageable, sent over to Asia Minor, from which country the insects had migrated, for dervishes to come and drive them away by incantations. These potent magicians prayed around the mosques and commanded water to be hung out on the minarets as a charm to entice a certain species of blackbird to come in myriads and destroy the destroyer. As to whether the birds came history is silent, but the precious water is still said to be preserved in the mosques; and the precious dervishes were perfectly successful in collecting much money for their valuable aid, eighty thousand rubles having been gladly given by the terror-stricken people whose all was in danger, even the poorest shepherd contributing a half-ruble.



The anathemas of the church have been frequently and successfully, if we can believe the chroniclers, hurled against the puny foe, who upon being exorcised fled in terror. Thus:

“In the yeere 1603, at Fremona, great misery happened by grassehoppers, from which Paez freed the Catholikes, by Letanies and sprinkling the fields

with Holy-water; whenas the fields of Heretikes, seuered only by a ditch, were spoyled by them. Yea, a Heretike using this sacred sprinkling, preserved his Corne which to a Catholike neglecting in one Field, was lost, and preserved in another by that coniured aspersion—so neere of kinne are these Locusts to the Deuill, who is said to hate Holy-water."

At least once the locusts operated in the cause of peace, for we are told that Tamerlane's army being infested by them, he read in it a warning from above to abandon his designs against Jerusalem.

The Mohammedans have a consoling tradition that lifts the responsibility of fighting the locusts from their shoulders. They say that after God had created man he made locusts from the clay that was left, the scourge being a just chastisement from heaven for the sins of the people,—a belief that renders the ofttime execrated Darwinian theory not only superfluous, but soothing to man's pride, in comparison.

The spotted wings of the locusts have given rise to many imaginings, for can one not descry upon the fateful insect signs of its supernatural power? Look steadily enough at the markings on the wings, with the understanding that they are leaves out of the book of fate on which are inscribed the destinies of nations, and from the general

obscurity there will presently shine forth certain symbolic signs, the letter *W* portending war, or *P* portending peace.

In 1712 a swarm visited Silesia, on whose wings were the letters B. E. S., which were variously interpreted by a distinguished professor of Greek literature at the gymnasium of Stettin. He wrote a learned work upon the subject, the German significance of the signs being, according to him, "Bedeutet Erschreckliche Schlachten" ("presaging frightful battle"), and "Bedeutet Erfreuliche Siege" ("predicting happy victory").

The little fingers about the locust's mouth have not escaped comment, being supposed to represent Greek characters signifying "I nourish." One should think this an unnecessary announcement on the part of this obviously well-nourished and much-nourishing insect.

The Hottentots have a curious superstition concerning the origin of the locust. They believe the creatures come from a great master-conjurer far to the north, who removes a stone from a deep pit and lets them loose, when they fly to load the table of the grateful Hottentot.

The symbolical locusts of the Apocalypse have a similar origin, for it is written of the angel:

"And he opened the bottomless pit; and there arose a smoke out of the pit, as the smoke of a great

furnace; and the sun and the air were darkened, by reason of the smoke of the pit. And there came out of the smoke locusts upon the earth."

The Arabs, we are told, bestow upon the locust a remarkable pedigree, and describe him as having the head of the horse, the horns of the stag, the eye of the elephant, the neck of the ox, the breast of the lion, the body of the scorpion, the hip of the camel, the legs of the stork, the wings of the eagle, and the tail of the dragon.

It seems to have been a general belief in ancient times that the immense swarms of locusts had an organized society like the bees and ants, although in the Bible, in the Book of Proverbs, we are assured that "The locusts have no king, yet go they forth all of them by bands." In Arabia the king of the locusts, or Sultan Jeraad, leads the host, and when he rises the whole swarm at once follows. An Arab, claiming to have seen the great Sultan Jeraad, described his lordship as being larger and more beautifully colored than the ordinary locust.

The Chinese, too, believe that the locusts are marshalled by a large and gorgeous leader; and it is not so long ago, if indeed the tale does not belong in the present tense, that our New England locusts were credited with having regimental discipline, and commanders with more splendid uniforms.

The truth is less romantic, however, though not less wonderful. The locusts have no leaders, yet notwithstanding this they rise in a body, all headed the same way, and all take flight in a given direction as though by some preconcerted understanding.

Of course locusts have been used as medicine, as what has not? and we are told that the eggs of some species are put by Jewish women in their ears to preserve them from earache. In Sweden the boys get the locusts to drive away their warts, the "molasses" having this highly beneficial virtue. The dried and burned bodies and excretions of the creatures have been put to more or less unpleasant curative uses.

The largest locusts on record are certain giants of India, which Pliny describes as being three feet long, and with legs so strong that the women used them for saws! One cannot help hoping, for the sake of the women, that these saws were better arranged for the purpose than are the spines on the legs of the humble locusts of to-day.

XV

THE ROCKY MOUNTAIN LOCUST

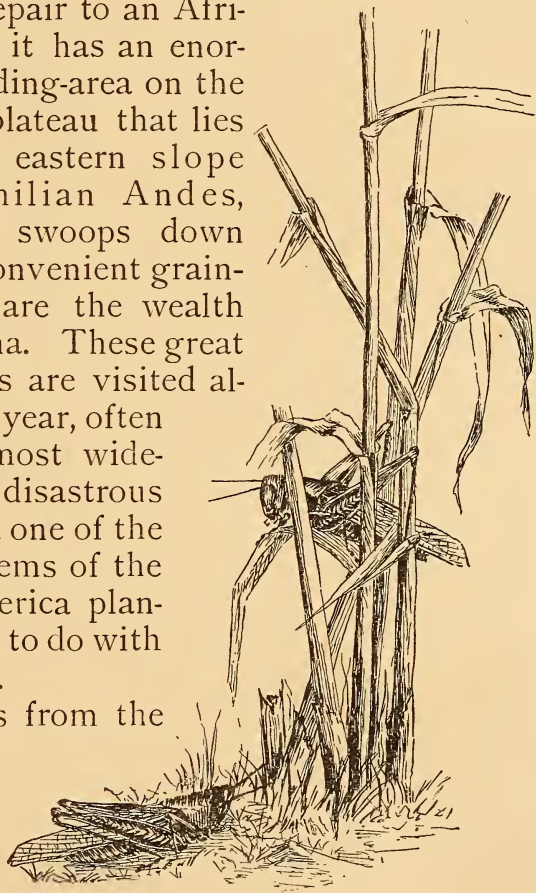
THE Eastern hemisphere has undoubtedly the greatest reputation for the production and consumption of locusts. Yet it cannot lay claim to exclusiveness on this account, for the other side of the globe has raised locusts enough and ravenous enough to give it a brilliant page in the annals of the insect.

Asia and Africa have the advantage of possessing many hot and arid regions of vast extent to serve as breeding-places, also the hot winds blowing from these regions that facilitate the hatching of the eggs; for the migratory locust is a true child of the desert, rejoicing in the fiercest rays of the hottest season.

Yet youthful America, with her habit of headlong success, has quickly made a few pages of history that are worthy a place alongside the thrilling chronicles of the East. South America is the possessor of a large locust almost identical with the migratory locust of the East. Perhaps it is a lineal descendant of that famous tribe —

who knows? With the true migratory instinct it sallies forth at intervals, laying waste vast tracts of cultivated land. Though it cannot repair to an African desert, it has an enormous breeding-area on the extensive plateau that lies along the eastern slope of the Chilian Andes, whence it swoops down upon the convenient grain-fields that are the wealth of Argentina. These great wheat-fields are visited almost every year, often with the most widespread and disastrous results, and one of the chief problems of the South America planter is, what to do with the locusts.

But it is from the



United States, agriculturally so fortunate in many respects, that we get the most vivid reports of the doings of the locusts; for though

it is slightly different from the others, we have a true migratory vandal within our borders. It is only about half as large as the famous destroyer of the East, greenish in color, with brown-spotted wings which, as is true of all the migratory locusts, are much longer than the abdomen.

But though smaller and probably somewhat less prolific than its renowned Eastern cousin, it is fully endowed with that enterprise said to be characteristic of all things American, and with true national pluck "gets there" in the most unequivocal and successful manner. It thinks no more of a little flight of a thousand miles in search of breakfast than a Chicago business man thinks of going around the world to get a change of air. It is very alert, and for a long time outwitted the shrewdest Yankee farmers in its tactics, bringing starvation upon the luckless settlers, who oftentimes planted miles of succulent crops apparently for its sole benefit. Outsiders respectfully call it the Rocky Mountain locust, though at home it is familiarly known as the Hateful Grasshopper, a name that carries its own confession.

Like all the migratory locusts it breeds in semi-desert places, which it finds in abundance in the high valleys and dry plains and plateaus of Colorado, Utah, Idaho, Wyoming, Montana, and British Columbia, sometimes

going as high as ten thousand feet for the purpose, and having at one time had possession of as much as four hundred thousand square miles of territory over which it ranged at will, using now one part, now another, as circumstances decided.

In early times the personal history of the locusts must have been tragic. When pressed by hunger to leave their own domains, what became of the immense swarms? Did they take their long southward journey only to fall at last victims to their own immense fecundity? The prairie grasses and unirrigated lands surely could not have supported their numbers; and thus no doubt their breeding was also lessened, many a monster swarm going out into space to be heard of no more.

When the kindly farmer came, however, the face of nature changed beneath his magic touch; grain-fields spread over the smiling land, and miles upon miles of grasshopper food of the finest quality suddenly adorned the earth. Then did the grasshopper arise and laugh; then did he clap his hands and rejoice with exceeding great joy and bless the farmer, — who, however, did not return the benediction.

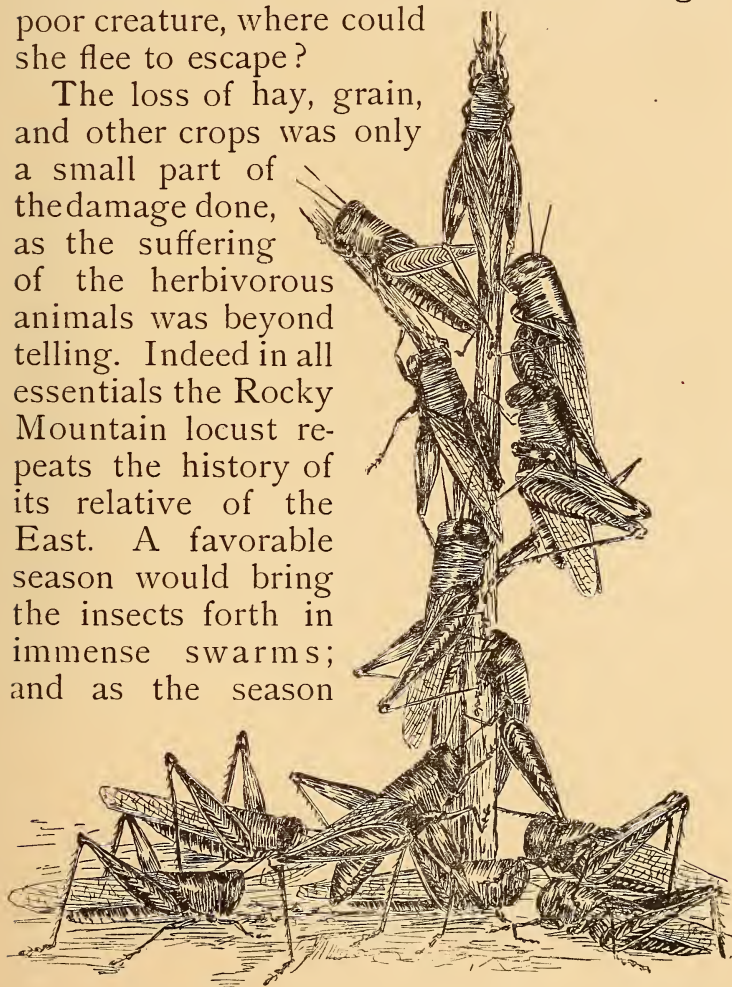
One can imagine the feelings of the men who, just come to a new and promising land, fields lying full of hope on all sides, hard

work about to be crowned with plenty, saw up in the sky a far gray cloud, the most ominous sight for many years that a Kansas farmer could see. On it came, drifting on the terrible northwest wind, filling finally the whole sky, the sun glancing on millions of fluttering, gauzy wings so numerous as to dim its very light. A beautiful sight, if the people had not been too alarmed to discover beauty in such a vision. The terrible moment arrived when this cloud fell like a heavy snow upon the roofs of the houses, upon the sheds and barns, over the flocks and herds, covering every foot of grain-field and garden, and then arose the ominous sound of feasting. For the uninvited guests were very hungry after their long journey, and fell with a will upon the delicious grain, munching away with a distinctly audible gusto. Before their ravenous appetites the green herbs disappeared as though a fire had swept the land. Every leaf was then stripped from the trees, the fruit hanging on the branches was eaten, and in desperation the insatiable hordes consumed as well the green bark on the tender twigs.

The noise of their flight was as the rushing of a mighty wind, and it was not uncommon for them to come with an unbroken front of fifty miles, and a length of one hundred miles. We are told that such a company made a noise sufficient to stam pede

tame cows! One would think the cow quite excusable under the circumstances, though, poor creature, where could she flee to escape?

The loss of hay, grain, and other crops was only a small part of the damage done, as the suffering of the herbivorous animals was beyond telling. Indeed in all essentials the Rocky Mountain locust repeats the history of its relative of the East. A favorable season would bring the insects forth in immense swarms; and as the season



favorable to them is not so to vegetation, being too hot and dry, the hungry hordes are

soon driven forth to find sustenance in their neighbors' borders.

When they rise in a body, what is it that prompts them? Did they in those years gone by smell the fresh pastures a thousand miles away? Or, driven by starvation, did they chance the future, trusting themselves to the force that bore them on, blind as to consequences but hoping for a happy termination to the venture? If the prevailing winds had set the other way, over the barren mountain peaks and the deserts, would they still have risen millions strong to be borne away to sure death in the wilderness? Who can say? All we know is that they do rise, in former years ascending until they encountered the great northeast air current that bore them airily balanced on distended wings sometimes for a thousand miles or more, to the fertile fields of the Mississippi Valley; for the so-called "Kansas grasshopper" is no native of Kansas, but came from far-away Idaho or some other more or less distant breeding-place.

Being so far from home, it probably was never able to return for the purpose of placing its eggs in the home hatching-grounds, but oviposited in the land of its visitation, sowing the soil with seeds of future woe. Though, like the other migratory locusts, it cannot thrive indefinitely in the more fertile,

which are also the damper lands, it can do enough active work in the two or three seasons at its disposal to ruin the population. The eggs are laid in the most favorable localities the insect can find, and the following season out come the unfledged young; tiny, relentless, pert-looking infants, that, as soon as they are sure of their legs, begin their course of depredation. On they march in the same irresistible fashion, devouring all before them, refusing to stay or turn excepting as their own will prompts, piling up knee-high in places, covering the railroad tracks sufficiently to stop trains, and proceeding hundreds of miles, until they acquire wings and take to flight.

This is quite the old story which has been enacted since long before the time of the Pharaohs in Egypt, and no doubt equally long in this New World—which so far as its surface is concerned is not new, but very, very old.

The Rocky Mountain locust never has caused, and never can cause, the misery that its fearful prototype in the East has caused, for the United States would not see her children die like flies, for lack of bread; she has plenty, and her children do not swarm to the extent of those dark-skinned natives of tropic countries. Yet the power of the creature is the same here as in the East, and the

early history of a large part of the fertile Mississippi Valley is one long fight with the locusts, a more difficult native to cope with than the quickly banished Indian. Minnesota, Montana, Dakota, Nebraska, Kansas, Missouri, Iowa, and even as far south as Texas, the plague has raged from season to season, sometimes threatening the total destruction of a large area of the country for agricultural purposes. In British Columbia and Manitoba the new colonies were sore pressed, and in the far West every State, even to the Pacific Ocean, has been devastated.

As soon as the fertile West began to be extensively planted there arose the cry of despair. In 1818 and 1819 such vast hordes appeared in Minnesota that in some places the ground was covered to a depth of three or four inches, and every green thing disappeared before them. The next two years they appeared farther north, laying waste Manitoba, and from that time on the records bear almost yearly reports of devastations in some parts of the locust-infested territory.

In 1855 there was a terrible invasion west of the Rocky Mountains, when the locusts spread over the Pacific slope and along the western regions of the Rockies, covering an area of country two thousand five hundred miles long and in some places twelve hundred miles wide. One could quite imagine

himself transported to the historic African lands at a time of great invasion. The locusts that infest the regions west of the Rocky Mountains have their own breeding-places, and are, in some cases at least, a different species from those ravaging the land east of the great range, though very similar to them.

Following upon the heels of the great Western invasion of 1855, we find the two succeeding seasons "locust years" in Minnesota, the marauders being so numerous that they even invaded the people's houses and did great damage indoors as well as out,



eating cushions, window curtains, shoes, and even revelling in heavy cowhide boots! The people had not yet learned how to fight the foe. The only record of any attempt to lessen their numbers seems to be of one canny farmer who gathered them by bagfuls, dipped them in scalding water, and fed them to his hogs.

The climax of the locust story east of the Rocky Mountains was reached in 1874 and 1876, when vast areas were overrun, and fifty million dollars' worth of grain eaten, by the insatiable visitors — a state of affairs that, occurring in Africa, would undoubtedly have caused one of those awful famines; and

the famine would have been followed by the equally awful plague in which the history of that country so abounds.

Texas in the memorable locust year, 1876, was so well supplied that her trains were delayed for ten days by the locusts piled on the tracks. The outlook was desperate. It seemed as though several of the most fertile of the Western States would have to be abandoned to the locusts, when merciful Nature came to the rescue, and in the Spring of 1877 a cold, damp season destroyed as by magic the plague that a few months before had seemed indestructible.

A vivid idea of the hopelessness engendered by these invasions is presented in the following extract from Packard's "Entomology":

"Last Spring the young were hatched from the egg in the early days of March; by the middle of the month they had destroyed half the vegetation, although the insects were wingless and not larger than a housefly. The first winged specimens were seen high in the air at about three in the afternoon; as a light northerly breeze sprang up, millions dropped to the earth, covering the ground in an hour, and destroying every green thing with avidity. During the night they were quiet, but at daybreak commenced to eat, and continued until ten in the morning, when they all flew southward. At about three o'clock in the afternoon of the same day another swarm arrived, ten times as numerous as the first; these again took flight the following day;

and thus they continued coming and going, day after day, devouring the foliage and depositing their eggs. At first they selected bare spots for this purpose, but finally the whole surface of the earth was so broken up by their borings that every inch of ground contained several patches of eggs. This visitation was spread over many hundreds of miles."

What wonder the people became discouraged? What wonder that many abandoned in despair the Eldorado to which they had gone with their all to start a new life in the rosy West?

Fortunately for man, the migratory locust cannot thrive in damp localities. Dampness seems peculiarly fatal to it, so that it can breed for only one or two seasons in the more fertile portions of the country. This alone has made North America — yea, the world — habitable. For not only do the infested districts have an occasional respite between the visits of the migratory swarms, but the whole eastern part of our country is safe from these destroyers, who are never seen beyond certain well-defined boundaries.

Since they are dependent upon the wind to help them in making long journeys, it follows that they are able to pursue only certain routes — borne on the prevailing air current; and when this has happened to blow at the right season from the high breeding-grounds at the foot of the mountains, it has

carried them to the sections where their name will abide forever in the history of the early settlers and their struggles.

As time went on the harried farmers learned to help themselves, ploughing up the eggs and destroying the marching armies by every conceivable device. But when the winged hosts came, there was no help; nothing could stay their furious onslaught.

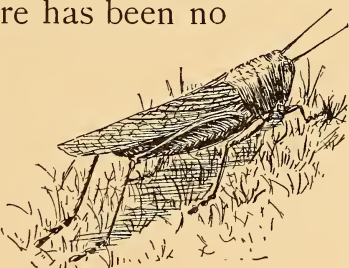
Whether the immense swarms ever rode the wind the whole way to their distant feeding-grounds without stopping, or whether they were obliged occasionally to alight for refreshments, is a point not thoroughly established. Oftentimes they did alight on the way, though sometimes they appeared not to. The distances they can go are almost unbelievable: certain swarms have been traced from their breeding-grounds on the Saskatchewan, in Canada, to the Gulf of Mexico, a little excursion of almost two thousand miles.

How a locust can maintain itself on the wing long enough to cover a space of a thousand miles or more is one of the marvels of this strange insect. What vitality! What patient endurance, to hang suspended, drifting on the wind for days—weeks maybe! That it can cover vast spaces without alighting is shown by its having been seen at sea in large numbers twelve hundred miles from the nearest land.

It is believed by some that the large air tubes are widely distended during flight, increasing the buoyancy of the insect. Thus it floats, a winged bubble, rising only when the friendly wind is blowing, taking its place on the aerial highway and going wherever fate guides, arriving — too often for man's good — at a glorious goal, a veritable locust's Eldorado, far from its unfruitful home.

Desperate as was the outlook in the lower Mississippi Valley, there has been no serious incursion since the dreadful year 1876.

The war has been carried into the enemy's own country, and in 1885 we hear of the permanent breeding-



place of the locust having been reduced from its original extent of four hundred thousand square miles to thirty-five or forty thousand. This came about through the cultivation of vast stretches of country in and near the breeding-grounds. The settlers who went in there fought the locusts with grim and unremitting determination, incidentally destroying many breeding-places by bringing them under cultivation; for nothing is so upsetting to a nestful of eggs as to be ploughed out where air, rain, and sun can get to it.

Cultivating the breeding-places of the locusts has saved the lower States in a more effective way, even, than by lessening the number of marauders, for the farmers have not yet succeeded in exterminating the hardy adversary that continues to issue forth in immense numbers every Spring. But now, finding ample pasturage near home, they save themselves the thousand-mile journey to distant lands, falling upon and devouring the substance of the newer and more northern settlers. Long-suffering Kansas must therefore in the future depend upon such trifles as drought, caterpillars, and cyclones for the discipline needed to save her from too great prosperity — as well as upon such locusts as she can manage to raise at home, — an art in which she is not without some little skill. Her neighbor Colorado had a first-class invasion in 1891 from home-bred raiders that proved only too conclusively that the Rocky Mountain locust is not the only strong vandal of the dreadful tribe. This new visitor, of a species hitherto considered rare, suddenly appeared in such abundance in the early part of July that the trains on the Santa Fé Railroad some hundred miles east of Denver were stopped on the track, and great damage was sustained in the infested district, though nothing in comparison to the ravages of the earlier migratory swarms.

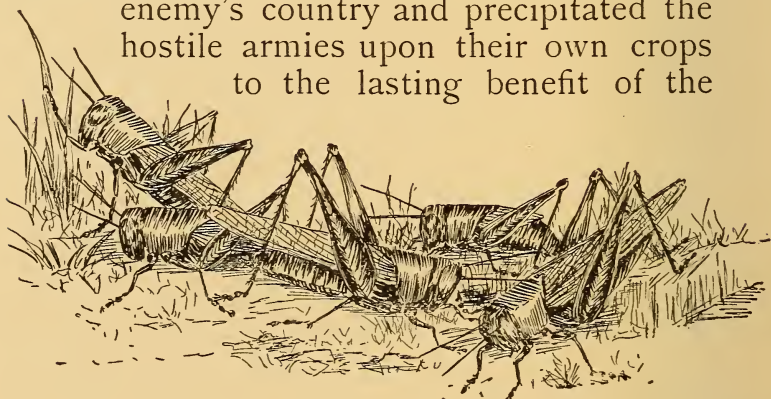
The Colorado invaders had such long wings, and flew so easily, that they are said to have resembled birds when speeding through the air.

The truth is, there are many locusts besides the migratory ones capable of doing vast damage, for all the tribe are good feeders, and nearly all are prolific. Each district has its own species, though none appear in such overwhelming numbers as that most successful of all propagators, the hateful grasshopper. Perhaps, also, none are so omnivorous, nothing being refused by a hungry swarm of these; yet even they have their preferences, devouring first the grains and grasses, then certain vegetables and tree leaves; finally, if the supply of favorite provender runs short, eating anything and everything they can lay hold of. Some species of locusts touch nothing but grasses; others have favorite garden vegetables; while Texas has a tough nibbler that regales itself upon oak leaves, to the destruction of valued timber trees.

Even the hard-pressed sections where the Rocky Mountain locust prevails are not so poor as to raise only the one grasshopper. On the contrary, there are a number of species that on the off years, or in company with the chief offender, assist in prematurely harvesting the farmer's crops. Indeed the

agriculturist could truthfully say, "The locust we have always with us"; and he must expect to share with it the produce of the earth, being ever on his guard against a sudden and overwhelming outbreak of these vigilant robbers of his hard-won crops.

As to those newer settlers of the Northwest who have invaded the very heart of the enemy's country and precipitated the hostile armies upon their own crops to the lasting benefit of the



earlier, far-away sufferers, they yet have their problem to solve every year anew — how to get rid of the locust. But the land is good, and well pays for vigilant action. Constantly, therefore, the war of annihilation goes on; constantly the breeding-area becomes more limited, eternal vigilance being the price of liberty, here as elsewhere.

Not only during the so-called locust years is the war of extermination carried on, but every season it is waged unceasingly, for

every year there are locusts in sufficient numbers to compel the farmers to fight them. The latter are not dependent upon vagrant swarms to eat them out of house and home, but, living as they do in the very nest of the nuisance, are always well supplied with the home-grown staple.

It has been carefully estimated that North Dakota and Minnesota saved four hundred thousand dollars on wheat alone in 1891 (which was not considered a locust year there), by carefully ploughing up the eggs the previous Fall, and later destroying in so far as possible such locusts as appeared.

That the traffic in locusts and locusts' eggs should afford remunerative employment to many is what would be expected; consequently, so well in hand is the plague in these later days that we have the humorous situation of locust-infested fields being placarded with signs warning off grasshopper-catchers! It sounds like a joke, and is only a shade less funny when we know that the fields are rented out to professional catchers, who thus protect their rights, warding off unlicensed intruders, principally in the form of the ubiquitous boy, who is eager to fill his coffers by active service in the lively campaign. Africa, however, has outyankeed the Yankee for once, a certain tribe of nomadic Arabs having put a capsheaf on the

wooden nutmeg story by making and selling artificial nests, when, in 1884, a good price was being paid for eggs after a severe invasion of the migratory locust!

In the United States the work of extermination goes on with unparalleled success in these days, for of late years there has been let loose upon the doomed locust a force of which he could not have dreamed when in his heyday of power he sailed his thousand miles joyfully to outwit and undo the Kansas farmer. The United States Government itself has honored him with its distinguished notice; it has rolled its awful eye on him, has seen, made long entries of his pranks in convincing ink, pronounced him guilty, sentenced him to extermination, and to that end has sent a handful of picked men to execute the sentence. The locust might well have laughed in full-hearted security at the advent of these absurd executioners. But when this new and apparently insignificant adversary proceeded against him with no locust-catching machine, kindled no fire, dug no ditch, merely took a few eggs and watched them and made notes of all that happened in the time and manner of their hatching and the growth of the young, then the discerning foe might well have stopped untimely laughter, being pervaded with an uneasy sense of coming misfortune. Although the captured eggs

were allowed to hatch and the young were well cared for, such a course was surely not in the final interests of the captives. It was mysterious, to say the least, and the mysterious in the tactics of an enemy is always alarming.

And then, could the long-victorious locust have known the meaning of those messages flashing over the telegraph wires from the Saskatchewan to Mexico! Could he have realized that at last that most potent of all forces, modern science, had been arrayed against him; that the despoiled farmers were banded together as one man from Canada to the Gulf of Mexico; that every movement he made was telegraphed to every district he might try to invade; that numberless devices were kept ready at a moment's notice to destroy him in the egg, in the wingless state, and in the full-fledged condition wherever and however he should appear,—he might well have lowered his crest and chewed his antennæ or the soles of his feet in troubled meditation over the all too impending catastrophe.

Never ceasing, the war of annihilation goes on; constantly the breeding-area becomes more limited, until the incomparable Rocky Mountain locust, like the noble Red Man, may in time become practically exterminated, leaving little more than a name and a thrilling chapter in the early history of the country.

XVI

THE DIARY OF A LOCUST

THIS morning I am here. I do not know where I was yesterday. They tell me I was born to-day, but I do not know what that means. I am here. The sun shines, and the ground feels warm and good. It is lovely to be here. And what a joy it is to eat! I feel as though I could eat the world. Not because I am hungry, but because it is so beautiful to chew up the sweet grasses, which taste better and better. I am a little bunch of happiness, although I can hardly stand up, my legs are so wobbly. I wonder why they are so wobbly. But it does n't matter so long as I can eat.

I am not alone. There are others like me all about. I climbed up a grass stalk this morning, and as far as I could see the earth was covered with happy mites like myself. It was a thrilling sight. I had no idea there could be so many of anything in the world, and they were all eating.

Two days later. How can anything be so happy as I am? My legs are no longer

wobbly. I can hold up my head and march along with the best of them. We are on the march. Grass became scarce, there were so many of us. We ate every blade, and in a short time were as hungry as ever. It is a strange thing, this hunger. We no sooner feel satisfied than it comes again as strong as ever—stronger, in fact. When the grass was all gone I tried to eat the ground, but it only made the hunger worse. Then I felt a sudden desire to go south. I do not know where the desire came from, but I yielded to it at once. The others all did the same, and that is why we are on the march. We soon came to fresh grass. We ate as we went. How delicious! But it is even better to walk than to eat, so we foremost ones walked on, and those behind ate the grass, and when they walked on there were yet others to come and eat what was left. I can't imagine how many of us there are. I climbed a weed this morning and looked about; it was like a sea of locusts as far as the eye could reach. And they were all happy and all eating. It was beautiful.

Then something very sad happened. An enormous locust, as large as thousands of us, I should think, with great black wings like thunderclouds, flew down among us. It came near me, and I was afraid it was going



to step on me, so I did something I had never done before, — I kicked myself along with my hind legs. All the others did the same. It was a wonderful sensation to throw yourself in the air, and I could not help noticing it, even though I was so scared by the big grasshopper. I kept on kicking myself along just for the fun of it. They call it hopping. Then I looked to see what the big grasshopper was doing. It is too terrible to think about. He was actually swallowing us! I got under a half-eaten grass blade and lay very still, frightened almost to death. He picked us up like grains of wheat, hundreds of us! — I don't know but thousands. It was the saddest sight any one could imagine. He went at last, and took all those grasshoppers with him. I hope in the midst of so much sorrow it is n't wrong to be glad he did n't catch me. They say he was a crow. I wish he would learn to eat grass. It is healthier and doesn't hurt anybody. Several other crows came among us, and no doubt did as the first one, though I was too far away to see. I was willing to be far away. Then some blue crows came, and some red and brown ones, and some with speckled breasts. They said these were birds. The crow looks like a bird, excepting that it is black and much larger.

They must have swallowed pecks of us, but unless you knew you would n't know, for there seemed as many of us as ever. I do not know where we all came from, I am sure. When we went by the mouth of a mountain gorge there was a stream like a stream of water, only it was made of locusts like ourselves. When we got there they joined us, and we looked more like a sea than ever. It is beautiful to go along surrounded by your own, and all so happy. If only there were no birds and crows!

Ten days later. I have had a most strange and trying experience. Some two days ago I began to lose my appetite. As soon as your appetite goes you cease to take interest in anything. I felt heavy and forlorn, and as time went on decidedly queer. My eyesight failed; everything looked dim and faded. My smell forsook me. I cared no longer for grass. It seemed to me I was suffocating. The sense of suffocation became so strong that I began to struggle for air, and then — I don't know how to tell it! — I heard a cracking sound, and found that my skin had ripped open down the back! It frightened me, and I struggled all the more, and at last got my head out of the hole. I immediately felt better and began to pull the rest of my body out. It took a long time, but was not very painful, for my skin, all dry and hard, seemed

to have quite separated from my body. It hung about me like a dry husk. At length I was all out but my hind legs, and I thought I should certainly pull them off, for my leg skin was bent at the knee joints at a sharp angle, and my poor legs had to be pulled around the corner. That did hurt, but I was crazy to get free, and so pulled away. The skin would not straighten, but my poor legs bent, if any one can believe it,—just bent over as though made of wax; and so I pulled them loose. Then I clung to the old skin and looked at it. It was a complete model of me, only very much shrivelled and dried up, and it was hooked fast by the hind feet. I wonder how I ever thought to hook fast. I don't remember doing it at all. Then I looked at myself,—dreadfully soft but all there; so soft I was afraid to move, and my hind legs as crooked as a snake's tail. I should have been worried, only I felt so well and happy I could n't. The sun seemed to get in and warm my vitals. Then I looked around, and behold! the whole army had come to a standstill. Some of them were very sick-looking, and some were wriggling out of their skins, and some were just out with their legs all crooked like mine; and I noticed how they had grown. I knew it was all right, since everybody was at it. It is a pity to be so soft, though.

Next day. Well, the trouble is quite over and all is right again. Even the softness has disappeared. Before the day was over I was as hard as ever and twice as hungry, and gayly took up the march with a multitude who, like me, were ready. Others are still changing their skins. I am larger than I was, which is lovely, for now I can eat more than ever before.

Three weeks later. We are still marching on, — and we have all changed our skins



again. I did n't mind it so much this time, as I knew what was coming when I began to feel queer and blind and lose my appetite. This time I swelled out much larger than ever before. If I keep on I shall be able to eat a field of clover without any help. Was anything ever so hungry as I am all the time? The more I eat the more I want to eat. I am glad grass and leaves grow everywhere. But when we have passed by there is n't much left! We found a field of lovely grain this morning. They said the farmer sowed it for us. We all love the farmer. He is a good man, who remembers the little grasshopper and works hard to

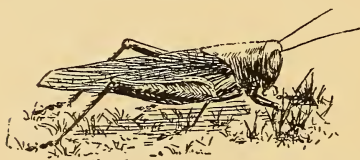
prepare the ground and plant fields for it. We ate every leaf. Grain is better than grass. Then we ate up a whole orchardful of half-grown fruit. The farmer prepared that for us too. We like the grain better, but he probably thought a change would be good for us. The truth is, we ate the orchard only because all the grain was gone, and all the grass, and all the tender things in the back garden. And we were so hungry! If we knew how, we should like to ask the good farmer to put it all into grain; but that might hurt his feelings, and we would not hurt his feelings for anything, he is so good.

A month later. We are getting to be so large! And now we do not mind changing our skins at all—it is so delightful to come out of them ever so much larger each time. Strong! How we can hop, and climb, and eat—best of all, eat! The only trouble is, we have to walk a long way, sometimes, to find enough; and some days I feel half famished, desperate enough to eat anything. I begin to wonder if there are not too many of us together, it makes such inroads on the food supply. I am sure I do not know what we can do about it, though; we can't help being here, and there is nowhere to go, excepting where we do go—to the nearest feeding-places. Terrible things have happened to us lately. So many creatures have

come along and swallowed us, one snake particularly. He looked like a sausage when he got through. He could hardly move, he was so full. It was a sad sight. Life is not all joy, as we used to think when we were young; but we must keep up our spirits, for after all there are a good many of us left. Indeed it is impossible to see where any have disappeared, the crowd is so enormous—and so ravenous. Oh, well, one might as well be happy, so long as one is n't swallowed one's self. Then came several days of rain. It really looked as though we should be done for. Indeed a good many of the smaller ones died, but myriads survived; and this morning in the sun we started on as brisk as you please, for we can smell grain-fields not so far away and the tooth of hunger gnaws. How disappointed the good farmer would have been if we had all been killed by the rain! I am glad for his sake too that so many of us survived. There are quite enough to do justice to the good things he has provided.

A month later. How to tell it — that last moult! When the skin fell off, out dropped — wings! Yes, wings! And none too soon, for we were nearly starved. We had been finding only patches of grain here and there, for the farmer is scarce about here, and there were not weeds and grass enough to satisfy

the cravings of hunger. That day of wings! Who can ever forget it? We rested until the following day, not fully understanding; then, just as the desire to march came, so came the desire to fly. All at once we vaulted into the air. Our new wings seemed to open of themselves. Without any practice we began to fly. Up, up we went until



we struck such a delightful breeze! We went along with it for a time, and our new wings did not tire. Then the breeze freshened, and we turned around and just held open our wings and were carried like ships adown the stream. Such a sensation! You feel like a bubble floating along, so light and full of air. At night we dropped down to rest, but in the morning were up and off again. We do not think of eating. Someway this wonderful flying satisfies even our hunger.

Some time later. I do not know how long we have been floating down the air stream — forever, I think. I am in a daze, and beginning to feel very faint; a smell of growing grain this morning made me fairly ache with hunger. We shall get to it soon, judging from the odor, which now grows perceptibly stronger and stronger. I now know where we are bound for. We are heading straight for

the glorious grain-fields of Kansas. There is no one like the Kansas farmer. He works early and late to get things in readiness for us locusts, knowing how nearly starved we shall be.

Later. Down we dropped, too thick in places, for we piled up on each other; but I think everybody found a blade to nibble. Heavens, how frantic we were! We mowed those fields down as by magic. You would never know there had been a spear of grain after we had passed on. The farmers ran out when they saw us, the farmers and the farmeresses and the young farmers. They waved their arms and tore at their hair. That is their way of expressing delight. It seemed rather uncouth, but I should not criticise any one so good as a farmer. With our chewing we made a noise that could be heard a long distance. It must have been music in the ears of the good farmers.

Later. Well, I certainly feel good. This country is full of farmers. As soon as we have cleaned out one we rise on our beautiful wings and seek another. Such appetites! Never was hunger so stinging, never so delicious the art of appeasing it. And never were locusts blessed with such abundance. And yet! — and yet! As one grows older life grows sadder. Now about the farmer. I have had a terrible shock. He does not

sow his fields for our benefit, I now feel sure, but for his own. He entices us here only to make use of us; in truth, although I have never caught him in the act, I feel sure he feeds on us. This is almost too awful to breathe, yet I feel sure it is so. One farmer dug deep trenches and shovelled many of us in; I saw it, but escaped myself as by a miracle. Once in, he built a fire over them. Unless he meant to eat them why should he roast them? Alas! alas! Why cannot the farmer learn to live on grain and grass, as we do? Such food is far healthier and harms no one. But life is very sweet notwithstanding. Something so beautiful has happened. I have discovered how lovely is the young Eliza, the loveliest thing in all the world. I never knew it until my wings came; then I found it out. I want to be near her all the time, and I am so happy I do not even care to eat if she will only look at me once in a while. Oh, I am so happy!

Later. I am still happy, excepting that I cannot escape a terrible sense of uneasiness on account of a great swarm of flies that has suddenly appeared. These creatures hover over us and fill me with a terror that is like to kill me. They do not seem to hurt us, and yet there is that dread of them in the breasts of all of us. When we see one approaching we dodge about in every direction,

mad with fear. What does it mean? Finally one succeeded in lighting on me; it stayed only a moment and did not hurt me at all, and yet I was sick with fear. I think it must be a superstition, for it certainly did no harm.

A few days later. Alas, there was cause for fear! All at once I felt a pain in my side where that fly had been, — a burning, sharp pain that did not last long, but ever since then I have been in trouble. I no longer think of Eliza. I eat ravenously but fitfully, and more from a sense of duty than



for pleasure. I seem to be ill-nourished. I think I must have been poisoned by that fly. All my happy feelings have departed.

Later. (The story continued by another locust.) Poor John is dead. The fly laid an egg on him, and it was the going in of the grub after it had hatched out that he felt. The terrible grub ate him up alive. It is just as well he is dead. Everything has gone wrong with our army. The farmer we now believe hates us. He destroys us in the most frightful and wholesale manner,

Everything seems to feed on us. Our eggs have been laid, acres upon acres having been ploughed up with our ovipositors beforehand. Such a sight it was! It would have been glorious if we could have looked forward to the hatching out of that brood. It would have covered half the earth, I think. But the ground is littered with our dead. Soon after the eggs were laid most of the layers died. Then the others began to go. There is left only a little handful out of our great army. The nights are very cold. We are half numb all the time; no pain, but utter loss of all interest in life. It is a great change, but I feel too stupid to care much. I feel sure that a few days more will see the end of all our vast army. What will become of those eggs? Were the farmer what we had so fondly believed him — but alas, he is cruel! What will become of those eggs?

XVII

OUR EASTERN LOCUSTS

THE Rocky Mountain locust has been more in the eye of the public than any other of the North American grasshopper kind, yet it is by no means the only destroyer, and as we know, it is very far from being the only locust. Indeed, there are some five hundred species of locusts in the United States alone; but fortunately only four or five of these are migratory.

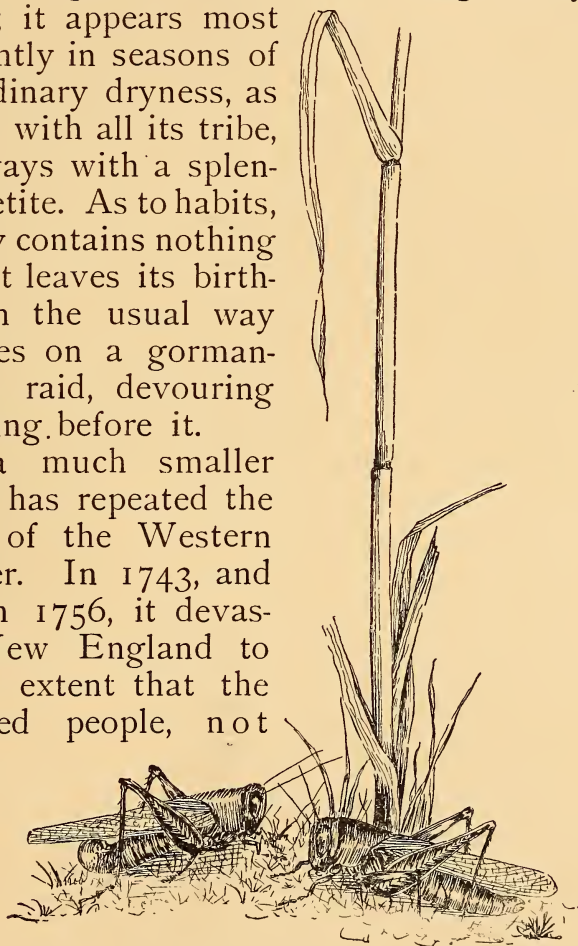
The Eastern farmer needed not to lie awake fearing a raid from the Rocky Mountain locust, even in its worst years, for it never has crossed the continent from west to east, and never will. Not that it would necessarily be deterred by distance from paying an unwelcome visit to the Atlantic Coast, but in order to make its phenomenal journeys it is so absolutely dependent upon the wind that it streams along on the prevailing air currents; and, fortunately for the Eastern farmer, these do not set from grasshopper-land his-way-ward, but go sweeping down the Mississippi Valley

bearing the famished hordes to the grain-fields of Kansas, Nebraska, Missouri, and all that region. Rather it should be said these currents did so bear them, since, fortunately, the raids of the migratory locusts to those parts must now be spoken of in the past tense.

But though safe from that terrible scourge of the West, the Eastern States are not entirely innocent in the matter of harboring locusts: they shelter that most widespread of all the tribe, the little Red-Legged locust, a creature of such adaptability that it ranges successfully from the Arctic Circle to Central America and from the Atlantic to the Pacific. That is to say, it is found in greater or less numbers over all that vast extent, and though it cannot in point of destructiveness vie with its near of kin, the Rocky Mountain locust, yet its depredations are more frequent, and it appears in more localities than any other of its race. It is one of New England's most relentless chasteners among the grasshopper tribes. It is a true grass-eater, preferring rather low places and rank vegetation. In appearance it is somewhat insignificant, being only about an inch long, with a greenish-brown body, long brownish wing covers, and clear hind wings; its name, "Red-legged," comes from the hind tibiæ, which are blood-red, with black spines. But it will not do to judge a Red-legged locust by appearances

alone, for though insignificant in looks it is capable of great works. It is dangerously prolific; it appears most abundantly in seasons of extraordinary dryness, as is usual with all its tribe, and always with a splendid appetite. As to habits, its story contains nothing new. It leaves its birth-place in the usual way and goes on a gormandizing raid, devouring everything before it.

On a much smaller scale it has repeated the history of the Western destroyer. In 1743, and again in 1756, it devastated New England to such an extent that the frightened people, not



knowing what physical force to apply, had recourse to spiritual aid, days of fasting and prayer being appointed.

From time to time we hear of incursions of locusts in all the Eastern and Southern States, and generally it is the Red-legged locust that thus distinguishes himself. He is particularly execrated along the North Atlantic Coast because of his fondness for salt grass, at times quite consuming the crop of marsh hay before the farmer has a chance to gather it; and since in some sections this hay is the farmer's chief reliance for feeding his stock through the Winter, its loss is a serious matter. After consuming the meadows these gormands move back upon the other produce of the farm, leaving little or nothing for the rightful owner.

In 1798 the locusts were particularly pestiferous in sections of New England, where they consumed even the laborers' garments hung up while the owners were at work; they voraciously ate sawdust, biting out the loose particles in pine boards. These hearty eaters were doubtless the Red-legged variety.

Here, as elsewhere with migratory species, when the wings are acquired the insects collect together and mount into the air in swarms, though they do not seem to be driven to this by necessity; and it is said they often return to the place whence they departed. With how cordial a welcome their homecoming must be greeted!

It would seem that flying for flying's

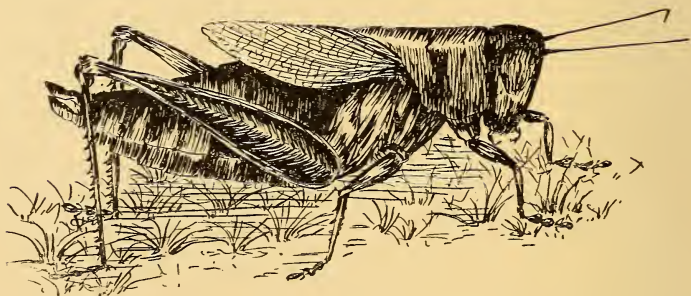
sake is a favorite recreation of the æsthetic locust, who, having wings, believes in enjoying them, and when he has no cause for true migration, satisfies his instinct by rising with numberless like-minded comrades and taking pleasure-trips in the upper air. The swarms thus formed are of very creditable proportions, though they do not seem ever to have been able to darken a New England sun.

Although the Red-legged locust is so abundant and troublesome in the East it is by no means the only locust on the scene. There is the so-called Lesser Migratory locust, which often outdoes even the Red-legged raider in the extent of its depredations, not only upon New England, but also in the Middle States and the South.

But besides the gregarious species, there are many locusts of solitary habits, whose voracity, joined with that of the long-horned grasshoppers and crickets, — all good feeders and all lovers of man's crops, — forces us, willy-nilly, to share liberally the bounty of nature with these other children of the teeming earth.

Although most of our locusts are modest in size, the South has one that is not, the Great Lubber grasshopper being a very giant of its kind. It is nearly three inches long, — as long as the migratory locust of the

East,—and very much heavier than that famous insect, though unlike that it is short of wing, which adds to its general appearance of clumsiness. When this first comes out in the Spring, it is a striking-looking infant, both for its large size and its fresh colors, being vivid black with yellow markings. It is strong and pert-looking, holding its head high, as though conscious of its superior



beauty. It grows fast, eating what it can get; in Florida it prefers the aromatic leaves of the orange and lemon trees, to which it often does serious damage. When full grown, it is a large, thick-set creature of sluggish habits, quite gayly colored with red and yellow. Its corpulency sometimes subjects it to a very ignoble end, for the people kill it by merely throwing it hard against the sidewalk. Accidentally to step on a live one is an experience not soon to be forgotten.

There is another of the Southern lubbers found farther west, and this one is so clumsy

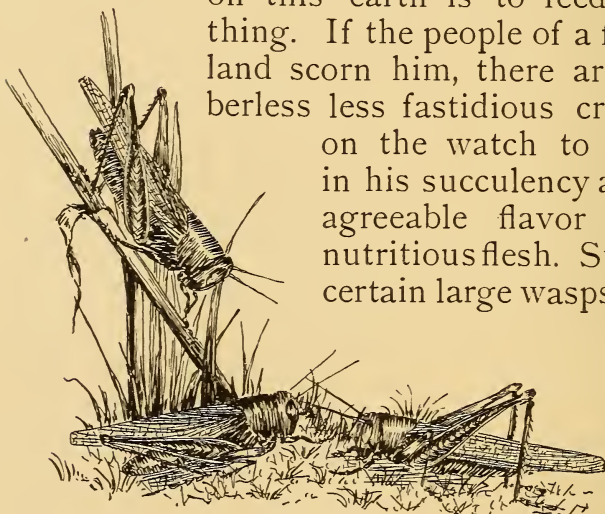
as not to have any wings at all, or at least the merest rudiments; but it eats as well as its winged relatives, and brings distress to the places that harbor it.

Although the locust is so successful in the way of progeny, it has its troubles. As we know, everything with it depends upon climate; the largest swarm, covering hundreds of square miles, may be exterminated to a locust, in spite of the billions of eggs correctly placed in the earth, by the advent of a cold, damp Spring. Instead of yet greater numbers of swarming despoilers, the land smiles above tons of addled eggs, which go to enrich the soil of the triumphant farmer. Even in their natural breeding-places all seasons are not alike favorable to the hatching of the eggs. Oftentimes several years will pass without the necessity of migrating to any distance, the very climatic conditions which operate against the development of the locusts working favorably for the growth of vegetation, so that the limited numbers are able to find plenty of food near home. Climate is undoubtedly the greatest force in controlling the locust after the modern and concerted plans of man himself, who is learning by bitter experience to fight successfully.

Besides these checks, however, there are numerous natural forces at work. One is a curious kind of fungus that attacks the insect,

quickly enveloping the whole body, covering it with a thick, whitish, felt-like growth. Who has not seen these mouldy-looking grasshoppers attached, dead, to the grass stalks?

Again, one of the main uses of the locust on this earth is to feed something. If the people of a favored land scorn him, there are numberless less fastidious creatures on the watch to rejoice in his succulency and the agreeable flavor of his nutritious flesh. Such are certain large wasps. Rec-



ognizing in the locust a highly concentrated and agreeable pabulum, they provision the dark underground nests in which their eggs are placed with well-stung but living locust; for the sting, as we remember, paralyzes without otherwise injuring the victim. Let us hope, even though he is a locust, that his feelings as well as his muscles are rendered insensible to what is so soon to follow.

Even the fly, with no strength and no sting, manages to include the locust in the

food of his precious progeny. There is one species, the *Tachina* fly, in appearance much like a large house-fly, that has the brazen habit of lighting on the locust and without any ceremony attaching an egg to its person. The locust is none the worse for this, but in course of time the egg hatches into an evil grub that, though no larger than the head of a small pin, has the power, like the greatly exploited hole in the dyke, of destroying the whole community. With its microscopic jaws it makes a hole in the armor of its unconscious host, enters thereat, and proceeds to consume his vitals. This not unnaturally ends the career of that particular locust; and since these flies are sometimes exceedingly numerous, hovering in clouds over the locusts, they may render even a large swarm quite harmless.

Of the many insects that consume and thus curtail the numbers of the grasshopper folk, certain tiny parasites rank high. These find their way to the eggs in the nests, or take up their abode on the adult insect. What summer idler has not noticed the little red dots that are often clustered about the upper part of the locust's legs, or under its neck, or at the bases of its wings? These minute gormands gradually drain away the life of their victim by their numbers, doing to him what he through numbers has always been doing to the crops of the men of earth. All hail to the little red parasites!

Birds, of course, are inveterate locust-eaters, the size of the insect being the only difficulty to the gluttons that swallow their tidbits whole.

The denizens of the farmyard would ask nothing more of fate than an unlimited supply of young locusts all the Summer round; and their neighbors the prairie chickens and quails fully share their sentiments on the subject. In a locust-infested region they, like the Bushman, grow sleek and well favored, the only bar to their bliss and the farmer's profit being the fact that the insects grow and get too large for them before they have had time to eat them all up.

The favorite age of the delicacy is immediately after it hatches and when it is no larger than a grain of wheat. What millions of these succulent morsels then slip down the throats of the gleeful gormands! As the insects increase in size, they are of course consumed in diminishing numbers, the full-grown form being, alas! too large even for the chickens, and far too large for most other birds. For nearly all kinds take a share in the bountiful feast, blackbirds, robins, larks, and crows falling upon it with amazing relish.

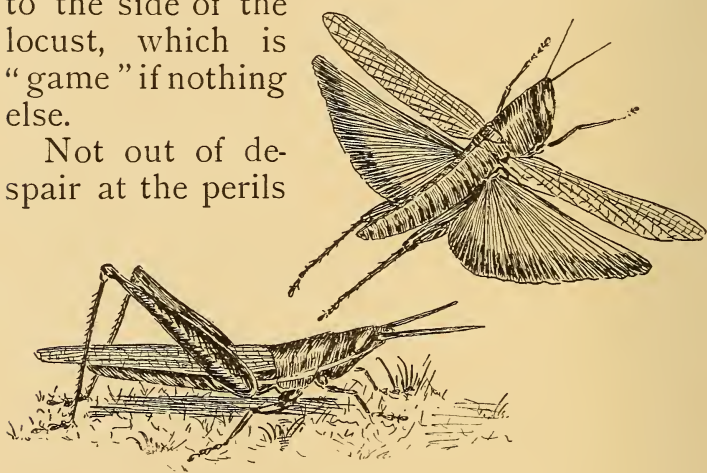
In a contest of locust-eaters, however, that haughty American bird, the turkey, would easily bear away the first prize. To see a

flock of turkeys out on a grasshopper hunt is something to live for. With a shrewdness one would hardly expect from a creature with the head of a turkey, the flock stretches out in a long line, often forming a semicircle, then the birds march on over the field of martyrs, intent upon business, driving the frightened quarry before their heavy steps, and snapping up every one that comes within reach. Thus they drive and gobble up the besieged army, until the wonder is that one small turkey can contain such numbers. Young turkeys, if given the chance, would fit themselves on this food alone to grace with unctuous and plump beauty the Thanksgiving carnival.

The same is true of the gallant hog, who consumes locusts with the relish of a Bedouin of the desert, not even demanding that they be fried in oil or served with salt and spices, so eager is he to offer locust-fatted hams and bacon to the despoiled farmer, who, disdaining the crude insect, gratefully breakfasts on home-raised pork and imported beans. Toads, lizards, and snakes also lend their appetites to diminish the toothsome hordes. Indeed so many are the consumers of the appetizing locusts, and so destructive to them are climatic conditions, that it has been estimated that not more than one out of every ten eggs laid comes to maturity. What

a task is theirs to produce creditable swarms under such conditions! There are moments when one's sympathies veer violently around to the side of the locust, which is "game" if nothing else.

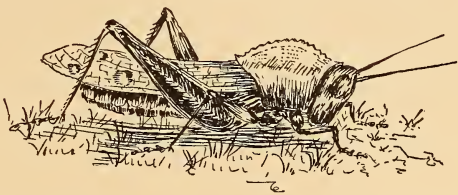
Not out of despair at the perils



which beset a locust's life,— though one begins to feel that this too might be understandable,— but quite accidentally, the locust is said now and then to commit suicide. This it does by hopping recklessly among sharp-pointed grasses, which spear it between the folds of its armor. This must be of very rare occurrence, however, the whole tribe being armored as though on purpose to protect them against such accidents; to a soft-bodied grasshopper a spear of saw-grass would be as serious a matter as a row of steel blades to the naked body of a man.

Particularly about the head and thorax

the plates of the locust's armor are large and heavy. Indeed it is oftentimes caparisoned in a way that absurdly resembles the huge leather collars worn by European horses, the likeness being yet further heightened by its long face and large eyes.



This resemblance is so obvious in Italy, where the big-collared horses do much abound, that the locust is known as a *cavalletta*, or little horse. In Germany it is the *heupferd*, or hay horse, since besides bearing the trappings of a horse it also eats hay.

Some of our real locusts, with their heavy armor, almost merit the description of the fabulous insects of the Apocalypse, of whom we read:

“And the shapes of the locusts were like unto horses prepared unto battle; . . . and they had breastplates, as it were breastplates of iron.”

While the locusts as a rule have great poverty of ideas in dress and form, there is an occasional genius in the family, one at least among them having aspired to the more graceful grasshopper lines, with a result that, though undeniably less clumsy, is somewhat fantastic.

XVIII

MEADOW GRASSHOPPERS AND KATYDIDS

“ Green little vaulter in the sunny grass,
Catching your heart up at the feel of June ! ”

THUS sweetly sings Leigh Hunt of the meadow grasshopper, and right well the gay little vaulter merits a poet's happy thought.

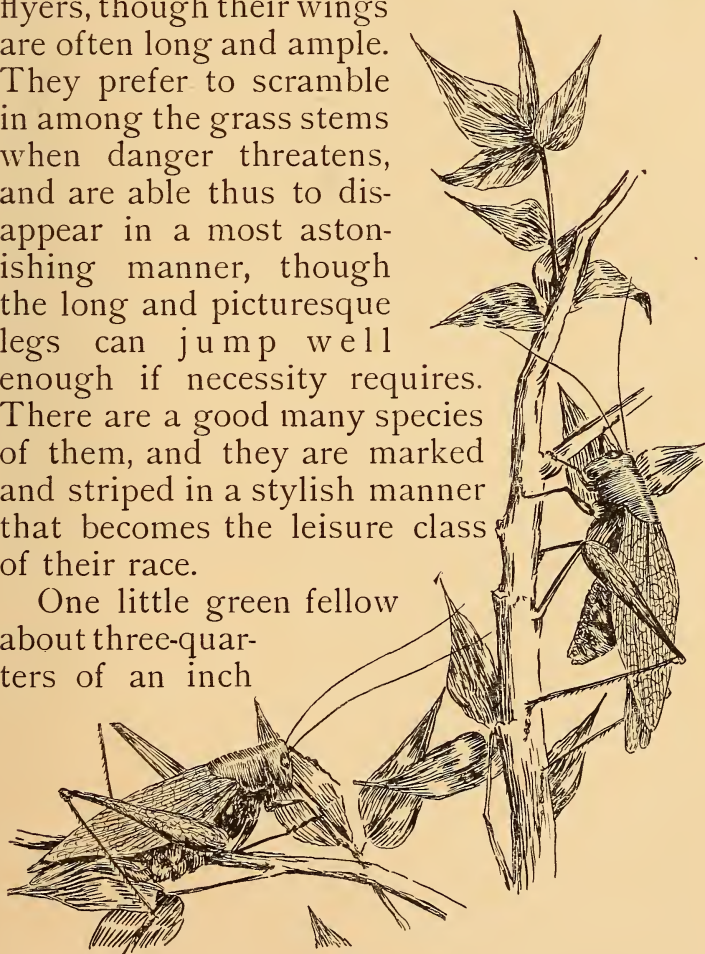
It is with relief that the summer idler turns from the unrestful performances of the locusts to contemplation of the pretty and harmless long-horned grasshoppers, which we call meadow grasshoppers when they pass their lives among the grasses and weeds, and katydids when they live up in the trees.

They are all of them dressed in green. At least, with a very few exceptions they put on Summer's colors. They are graceful sprites with the daintiest of long legs, the females bearing sword-shaped or dagger-shaped ovipositors. It is they who have the thread-like antennæ which they wave and dip about in such a pleasant manner. We seem quite to have left the world of sordid cares behind, the work-a-day world, where

grasshoppers are made for use rather than for beauty, and to have entered into a sphere much more poetical and much more appropriate to summer dreaming.

The meadow grasshoppers are not great flyers, though their wings are often long and ample. They prefer to scramble in among the grass stems when danger threatens, and are able thus to disappear in a most astonishing manner, though the long and picturesque legs can jump well enough if necessity requires. There are a good many species of them, and they are marked and striped in a stylish manner that becomes the leisure class of their race.

One little green fellow about three-quarters of an inch

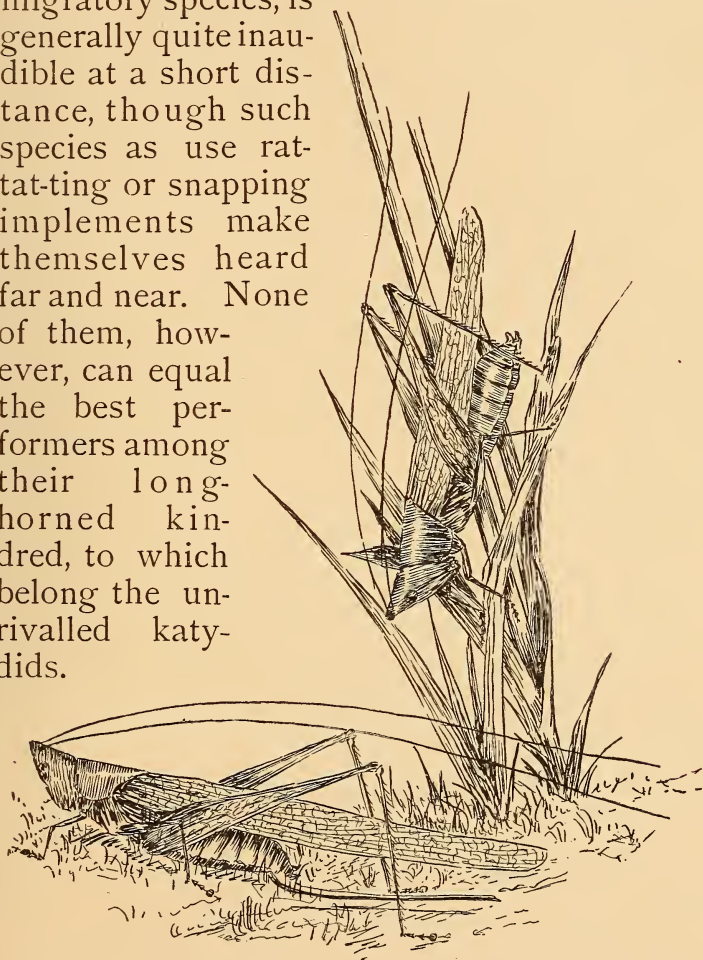


long, a native of New England, and common in its fields and meadows, has a brown stripe on top of his head and one on each side of the thorax, and rejoices in a fine-sounding Greek name, which, when translated, is better than high-sounding, for it means, "I dance in the meadow," by which it is evident he can convert the scientist into a poet.

The grasshoppers do not congregate together like the locusts, but dance in the meadows where and when they please, with no great care as to what other dancers may be doing. And they do not fly for the fun of it, probably never going on excursions of any length, and—best of all from man's point of view—they are not seriously destructive to vegetation; for though, being plant-feeders, they take their share from the tables spread by nature over field and meadow, they have reasonable appetites and do not produce excessively large families.

Indeed, if these were the only representatives of the race, one could think of the grasshopper tribes with no other than agreeable feelings for the pretty chirpers, unless occasionally a wave of resentment should sweep over the unappreciative listener to their summer hubbub; for the long-horned grasshoppers are the musicians of the whole race. If they cannot rival the locusts in flight, neither can the locusts approach them

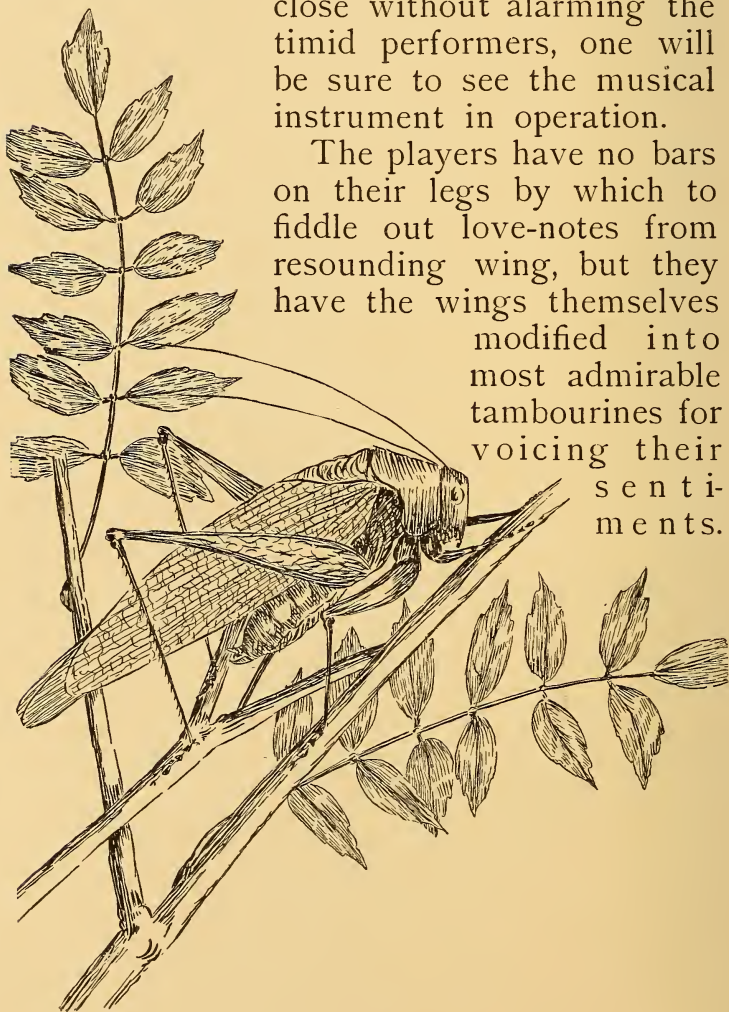
in power to make a racket. The feeble note of the fiddling locusts, to which belong the migratory species, is generally quite inaudible at a short distance, though such species as use rattatting or snapping implements make themselves heard far and near. None of them, however, can equal the best performers among their long-horned kindred, to which belong the unrivalled katydids.



Wandering about the summer fields, sitting down on pleasant banks to rest and

watch, one soon strikes up acquaintance with the meadow grasshoppers, and sooner or later, by the exercise of skill and patience in getting close without alarming the timid performers, one will be sure to see the musical instrument in operation.

The players have no bars on their legs by which to fiddle out love-notes from resounding wing, but they have the wings themselves modified into most admirable tambourines for voicing their sentiments.



Catching a male meadow grasshopper and looking closely at the upper ends of the wing covers, we shall see that they appear to be swollen and provided with curious ridges. Opening the wing a little and still peering closely, we see that the modified portions are a sort of rounded drum-head, delicate, sometimes transparent, but strong and capable of producing powerful vibrations in the air. They differ in appearance with the different species, but all have them in some form. When the musician is about to perform he raises the wing covers slightly, and then by some force starts these curious little drum-heads to quivering. His whole body often seems to flutter with the joyful exercise.

Each species has its own cry, which one can easily learn to recognize. And though the clamor may at moments become too distracting, who would banish the happy grasshopper from his summer hours? All people have loved the merry musicians, and all poets have sung their praises from the bards of ancient Greece to our own Keats, whose tribute to them is the most charming of all:

“The poetry of earth is never dead:
When all the birds are faint with the hot sun
And hide in cooling trees, a voice will run
From hedge to hedge about the new-mown mead:

That is the grasshopper's, — he takes the lead
In summer luxury, — he has never done
With his delights; for, when tired out with fun,
He rests at ease beneath some pleasant weed."

It is hard to decide which is the more charming, the dainty meadow sprite dancing and chirping among the tall grasses, or that delight of childhood, the katydid. Who has not in his credulous years puzzled over the mystery? Standing by the window in the cool night and listening for the curious confession that is sure to come with shrill insistence, the imaginative child cannot help rounding out the tale. What *did* Katy do? No one is able to tell, but something strange and impressive she must have done. Something not to her credit, judging from the equally insistent denial that so often follows the shrill affirmation:

"Katy did." "Katy did n't." "Katy did-did-did." "Katy did n't, Kate; Katy did n't."

So it goes on endlessly, with never another word to make clear poor Katy's waywardness. And we all join heartily with Oliver Wendell Holmes in his feeling for Katy, which he confides to us in a poem we all know:

"I love to hear thine earnest voice,
Wherever thou art hid,
Thou testy little dogmatist,
Thou pretty Katydid!

Thou mindest me of gentlefolks, —
Old gentlefolks are they, —
Thou say'st an undisputed thing
In such a solemn way."

There are several species of katydids in this country, and the cry varies in different sections, so that in some places one hears only the oft-iterated "Katy did." In other places there may be several extra cricks—giving emphasis to the original statement, or else the well-accented call of four notes, "Katy did n't."

The katydids, most picturesque of the grasshopper tribes, are tree-dwellers, one and all. Disdaining to live on the ground, they betake themselves to the high places, where of course their lives are in danger. But they have resources: their dress is an admirable disguise, and further to escape the prying eyes of hungry birds they maintain a discreet silence during the daytime.

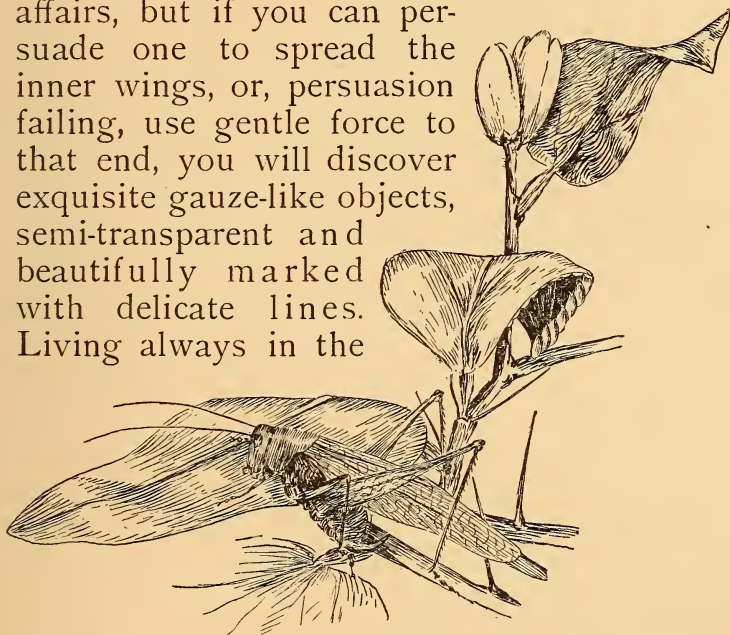
But when the heads of the birds are safely tucked under their wings, oh, then do the katydids lift up their voices in shrill ecstasies that can be heard for a quarter of a mile or more. Then do they spread their wings and fly from tree to tree, sometimes making the mistake of coming in at an open window, drawn by that blinding mystery, a lighted lamp. Under the safe curtain of the night they enact the little drama of their lives, and

as if to make up for lost time, ungallantly shout singly and in chorus the news of Katy's perversity, until we sometimes wish poor Katy at the bottom of the deep sea, together with all the chroniclers of her misdeeds.

In the North we are seldom troubled by the voices of the katydids, as we do not often hear more than one at a time, but in some parts of the South half-a-dozen may select the same tree from which to shout their tribute to Katy, and then—well, one *could* get on without them.

When three or four katydids get hysterical in a tree-top close to one's window and their din becomes quite unendurable, a short respite can be gained by striking the trunk of the tree. Instantly there is a welcome hush, the performers above your head waiting in deep suspicion to see what is going to happen next; and they will continue thus to wait for several minutes before gathering courage to continue their interrupted concert. They are the most timid of creatures, and it is very difficult to catch one unless by accident it comes into the room, or unless it gets "caught out" when day dawns, and takes refuge in some low-growing shrub where your keen eyes spy it out. Even so it may escape by the quickness with which it flees your fearful presence.

Besides their romantic if somewhat monotonous reference to the unknown Katy, these grasshoppers attract us by their personal appearance; they are so green and so long-legged and have such pretty, broad, leaf-like wings. The wing covers are dainty affairs, but if you can persuade one to spread the inner wings, or, persuasion failing, use gentle force to that end, you will discover exquisite gauze-like objects, semi-transparent and beautifully marked with delicate lines. Living always in the



trees, the katydids place their eggs on the twigs, or sometimes on the leaves. In Florida the strong evergreen leaf of the orange makes an admirable resting-place for the eggs of some species. The orderly katydid lays them in a row along the edge of the leaf, tucking one slightly under the

edge of the next, thus giving a very decorative appearance to the leaf so ornamented. Where the eggs are laid on twigs the bark is first roughened to help them to remain attached.

Although our Eastern katydids are green, out West among the mountains there is a little nun in gray that, thus dressed, escapes notice among its sober surroundings.

The wings of the katydids are like the ample cloaks of the troubadours of old, or like the skirts of bygone starched and stately dames, yet the prim little owners can fly well enough, fluttering through the air in a most pretty and ladylike fashion.

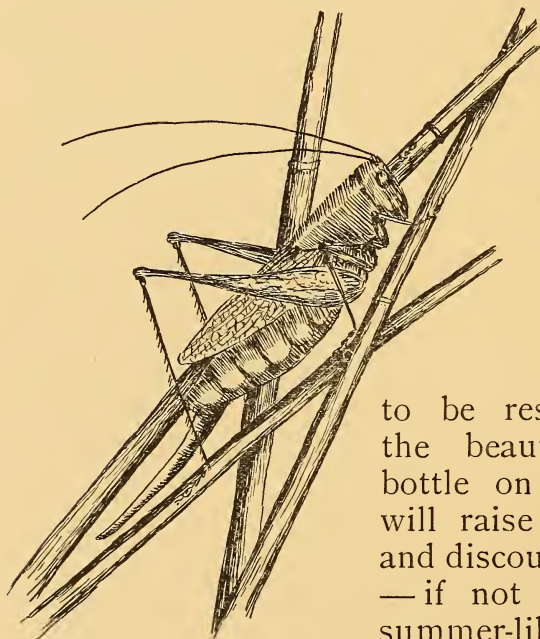
In our country all the katydid-like grasshoppers are true katydids, but this is not the case everywhere. In the Austrian wheat-fields there is a fine, large, green grasshopper with the broad wings and general make-up of our katydid. But it lives in the grain instead of in trees, and it has no knowledge of Katy, or if it has, it keeps quiet on the subject. Raising its wings as a katydid does, it shrills out several notes on its tambourine, but notes that bear no resemblance to the well-known call of our vocalist. It is a great ornament to the wheat, though the farmer who owns the fields may be too narrow-minded to appreciate this. One can but admire its taste in choosing to spend its

life in the wheat, for what more enchanting forest could a tiny inhabitant roam in? Where else are the trees so tall and straight, so close-grown, with such golden trunks and bending crowns of fruit? Some of us would enjoy living in a wheat-field even though not katydids and not small enough to have the grain-stalks assume the proportions of forest trees.

In these same wheat-fields is another long-horned grasshopper, very large, its dark green body heavily marked with brown and black, and having tremendously long legs, though its wings are short, sometimes shorter than the abdomen. It is a noticeable-looking creature, and one's first impulse is to pick it up — to get a better view. Easier said than done! It may have short wings, but there is no defect in its ears, and at the slightest sound away it goes scrambling between the wheat-stalks at a pace which causes you soon to give up the unequal chase. For besides not wanting to break down the wheat, one might as well look for the proverbial needle in a haystack as for a grasshopper in a wheat-field if it chooses to lose itself.

By careful manœuvring, however, and taking plenty of time, an unwary straggler that comes out on the edge of his cover can occasionally be snatched up. One's sensation when actually feeling one of these longed-for

prizes struggling in his grasp must resemble that of the ardent fisherman when a hard-won trout comes to his eager hand. These large Austrian grasshoppers are beautiful to watch; for not only can one see all parts of their structure very distinctly, but also their interesting motions, for even in captivity



they are always busy, eating, or cleaning their feet or bodies. And even in captivity the impulse to sing is not

to be resisted, and the beauty in the bottle on the table will raise its wings and discourse sounds — if not sweet, yet summer-like.

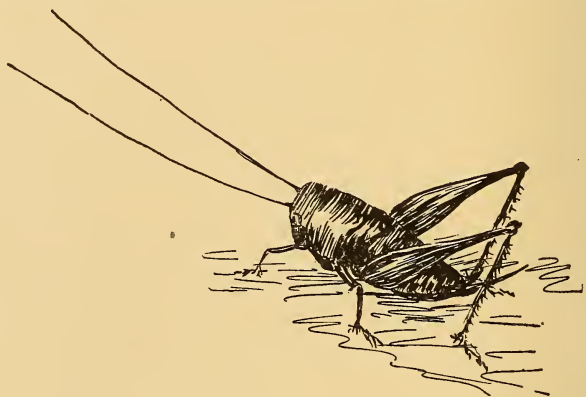
In some countries there are such agreeable chirpers, or else such appreciative listeners, that grasshoppers are kept like birds. In Japan the people have tiny bamboo cages for their little songsters of the grasses, which seems peculiarly appropriate to the Japanese

home. In Spain and other European countries the grasshoppers are caged and enjoyed, but the cricket seems to be the favorite insect musician of the Western world. In our own country there are performers whose note is pleasing, — though, truth to tell, for constant hearing many of us might prefer the low trilling call of some of the locusts to the loud cry of the tambourine players.

Some ears, however, are not disturbed by the shrillest performers, and for the simple reason that they do not hear them. Beyond a certain number of vibrations a second, the human ear cannot respond to sound. Moreover, some ears are far more limited than others. Thus it happens that two may go to the meadows together, and while one of them hears a mighty chorus of shrill cries resounding on all sides of him, the other hears nothing at all. The world is silent excepting for the voice of his companion, the sighing of the leaves on the trees, and the other low-pitched sounds of nature. It is quite credible that even the best ears fail to catch many a sound that stirs the feelings of the little residents at the grass-roots. There may be a whole orchestra charming the Summer far beyond any power in us to hear.

There are so many grasshoppers in the world! Besides the ordinary kinds that

would not excite any special attention on our part, there are many strange tropical forms in both the long-horned and the short-horned species. The tropics are rich in them, as in all other forms of life; they have, besides, certain giant forms, others of brilliant coloring, and some having legs or bodies



grotesquely ornamented with spines and protuberances.

And there are those what-to-call-thems, that are neither grasshopper, locust, nor cricket in looks, and that yet remind us of all three. They are variously called Shield-backed grasshoppers, and Cricket-like grasshoppers, being dull-colored, wingless, and given to living in the dark. Some of the cave-dwellers of near kin to these have no eyes and are of a pale and sickly hue.

As a rule these nondescripts are not

commonly seen, though in some parts of the South a large, long-legged species, whose mailed back reminds one of a shrimp, is very much in evidence in the nooks and corners of sheds. But when we think of grasshoppers it is of the pleasant little dancers in the meadow and not of these degenerate relatives.

XIX

THE CRICKET

HERE, at least, is one who needs no introduction! Everybody, whether summer idler in country fields or not, knows the cricket, merry house-mate who takes up his station with us by the fireside.

He comes out in the evening, when the cheery farmhouse is redolent with sweet cider and apples baking before the open fire; and when the children are cracking the nuts they have gathered and popping the corn they have raised, he comes out and sings to them with all the abandon of a hot Fall day on the sunny rocks of a pleasant pasture.

It is of him that Keats thus sweetly sings:

“The poetry of earth is ceasing never:
On a lone winter evening, when the frost
Has wrought a silence, from the stove there shrills
The cricket’s song, in warmth increasing ever,
And seems, to one in drowsiness half lost,
The grasshopper’s among some grassy hills.”

And then there is that immortal “Cricket on the Hearth,” which Dickens has given to

us, and which every man, woman, and child either has read or ought to read.

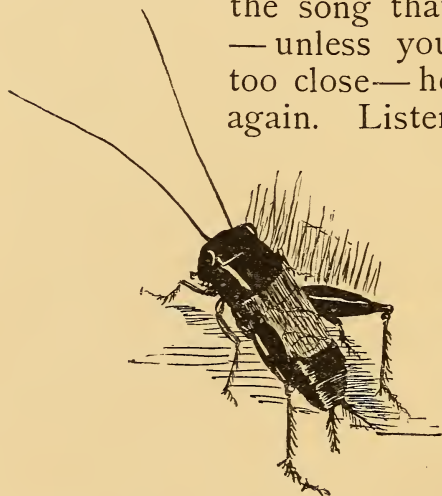
The house-cricket is not a native of this country, though in a few places it appears as an immigrant; yet we have our household fairy, as some species of our field-crickets often take to the chimney corner.

The cricket is not beautiful, but he is funny. He is black or dark brown, with a large head and large eyes which give him a certain air of intelligence that no doubt is well justified by the facts. He is so alert that when we wish to be very emphatic we say of some one that he is as spry as a cricket. Spry! Try to catch him on a late summer day when he has come out to sun himself at the edge of a stone. You will need to be spryer than a cricket if you succeed, for his strong hind legs well understand the useful art of jumping, though, truth to tell, he cannot jump as high or as far as a grasshopper, but scurries out of the way in quick short hops, which gain his end perfectly.

Hard as he is to capture, he is worth the trouble, for he makes a very agreeable companion shut up in a box or a well-ventilated bottle. He will surely sing if he is well fed and of the singing gender.

A good way to find him first and then to catch him—if you can—is to stand very

still and locate his voice; then advance rather close to where you think it comes from, which may be far enough from the right spot, as he sometimes seems to be a tricky ventriloquist for your benefit. He will invariably stop singing, but invariably his fears will yield to the greater pressure of the song that is in him, and — unless you are altogether too close — he will soon begin again. Listen as before until



you have re-located him, and if quite close, try to see him as well as hear him before taking another step. Proceed in this way until you have found him,

for he will always be out-of-doors, at some distance even from the door of his home, paying court to an obdurate lady-love.

Very slowly and gradually get close enough to see him standing with raised and quivering wings, head down, antennæ coaxingly pointed lady-ward. Then, if your conscience will allow you to disturb such bliss, suddenly grab for him. Perhaps you will get him. If not, you may as well go in search of another cricket,

When finally you succeed in making a capture, put him in your box and keep on trying until you have caught a mate for him. These two, if well fed on bits of fruit, decayed vegetable matter, or even cooked meat, and given frequent drops of water,—for they are thirsty souls,—will be quite happy, particularly if you give them two or three inches of earth at the bottom of their prison for the eggs when the time comes, and a little stone and some leaves to hide under.

They will become quite tame in a short time; but if you really want to keep them, cover their box with wire netting—otherwise if they decide to move they will quickly chew a hole in cardboard, paper, or even thin wood, and depart without so much as a good-bye chirp to their bereft captor.

If you have their peace and happiness at heart, be sure not to put more than one male in the cage. Where two are present, jealousy, rancor, rage, and finally slaughter may be the result; for crickets are hot-headed and belligerent creatures, to whom a fight is always welcome.

Crickets also develop a lamentable taste for brother insect when confined in a box with others of the six-legged tribe, and are as fond of locust as is the Bedouin of the desert or the Digger Indian.

Having made one's captures and got the

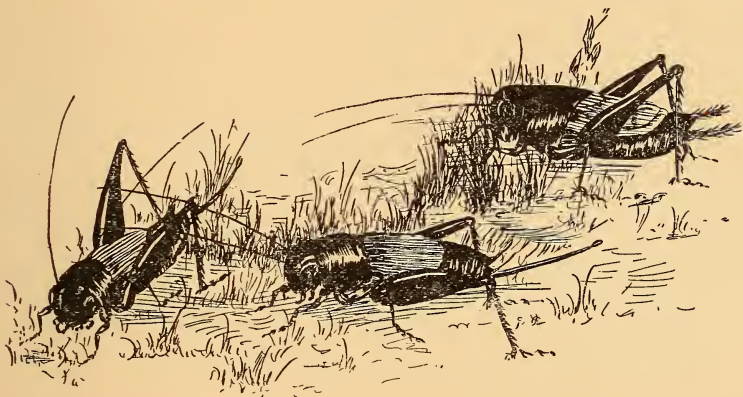
family settled and reconciled, a good deal of entertainment can be derived from watching the little minstrel shake his tambourines, as well as from examining his person.

The cricket is a homespun rustic, quite plebeian in form, having none of the grace of the meadow grasshopper, none of the beauty of the katydid, not even comparing favorably in looks with the locust. But with him, as with the rest of us, a good heart counts for more than good looks, and even deludes one into imagining external beauty; yet he is not always able to cajole his human admirers into the belief that his shrill cry is enchanting. Thus the poet Cowper implores him:

“ Little inmate, full of mirth,
Chirping on my kitchen hearth,
Whereso'er be thine abode,
Always harbinger of good,
Pay me for thy warm retreat
With a song more soft and sweet;
In return thou shalt receive
Such a strain as I can give.”

Yet many good souls find in his voice only the pleasing character of the singer himself. As Gilbert White of Selborne tells us, “The shrilling of the field-cricket, though sharp and stridulous, delights some hearers, filling their minds with a train of summer ideas of everything that is rural, verdurous, and joyous.”

The wings of the cricket are flat across his back and bend down on either side, making a sort of box-cover to his body. They are short and broad, for he believes that wings were made for singing, and cares very little about them as organs of flight. The whole top of the male wing is modified for purposes of song, being crossed by raised ridges and



its edges supplied with a sort of scraper. When about to play, the wings are raised somewhat from the body and rapidly rubbed together, which sets them into such vibrations that the air all around is thrown into tuneful tremblings.

The wings of the female, of course, are unadorned with crosswise ridges, which is one way to know her; another is the straight, lance-like ovipositor, which is used for placing the eggs in the earth.

Like the grasshopper, the cricket has his ears on the tibiæ of the fore legs, and that he hears well there is no reason to doubt.

Our crickets live in holes, under stones, or in rubbish piles, where they hide away; they come out to sun themselves, and often stand in their doorway with their antennæ waving in the air. They dodge back or scramble to cover in the most ludicrous manner when so much as a shadow passes over them. They have very long and sensitive antennæ to help them about their dark corridors, into which they often carry their provisions to eat in peace and quiet.

The time to make the acquaintance of crickets is in the Fall of the year, for then they have their growth, and, what is more to the point, their musical wings. While some winter over, as a rule the voice of the cricket, like that of the grasshopper, belongs to the latter part of the season; for the crickets run the usual course of their tribe, hatching from the egg in the early Summer, starting on their earthly career without wings, eating, moulting, and finally getting the precious organs by which they can produce their merry chirping, and at least some of them can fly when they wish.

European crickets appear to be distinctly more belligerent than ours, as the boys catch the common brown chirper by thrusting a

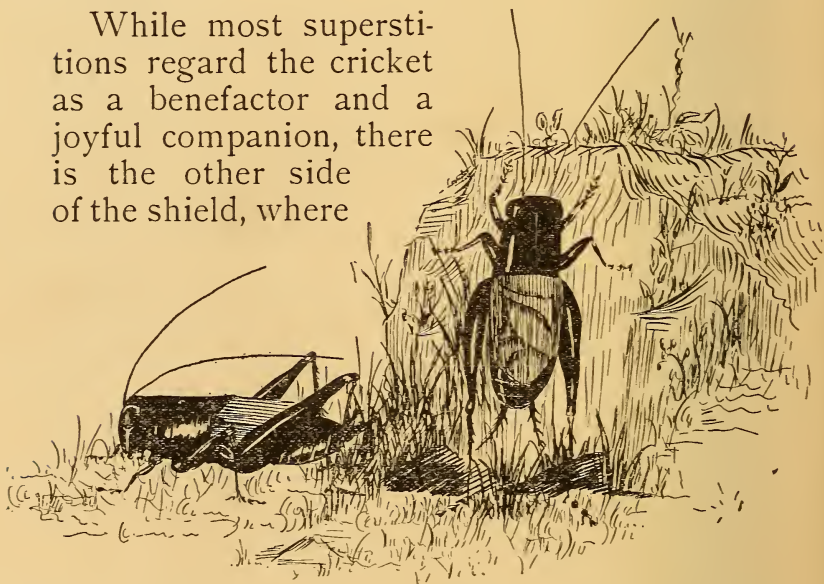
straw into its hole, when the enraged tenant grasps it so firmly that he is pulled out and often put to the base use of serving as fish bait. In France this unreasoning habit of the cricket has given rise to a proverb for the benefit of those deserving it—"More foolish than a cricket." The European cricket is so belligerent as to be constantly fighting with its cricket neighbors, and like the mantis, it is sometimes made to enter the lists for the entertainment of its noble captors.

The cricket's chirp, coming as it so frequently does from the chimney corner, is the best known of insect voices, and many think his little lordship the merriest soul alive. To have him about is a sign of good fortune, and his leaving a house he has been used to favor with his presence is a sign that some catastrophe is at hand,—in some places that a member of the family is about to die. If the cheerful voice reappears, however, that is a most favorable sign, betokening prosperity. Of course it is very unlucky indeed to kill the cricket on the hearth or to drive him away. In some places the merry sounds from the chimney indicate to the blushing maiden that her lover is on the way. We all know Dot's opinion in "The Cricket on the Hearth,"—"It's sure to bring us good fortune, John! It always has

done so. To have a Cricket on the Hearth is the luckiest thing in all the world!"

In some parts of our South there is the odd superstition that the crickets gathered about the warm hearth are old folks, whom of course it would be a great sin to kill.

While most superstitions regard the cricket as a benefactor and a joyful companion, there is the other side of the shield, where



the black little chirper is very black indeed, — of heart as well as of body, — and brings misfortune to those whom he visits, his cry even foreboding death in the family. Such prejudiced listeners to his merry tune are few, however, and the belief in his goodness is far more widespread.

Even Milton admits this innocent mirth-maker into his sombre "Il Penseroso," telling us that for purposes of meditation

"Some still removèd place will fit,
Where glowing embers through the room
Teach light to counterfeit a gloom, —
Far from all resort of mirth,
Save the cricket on the hearth."

The song of the cricket is listened to with peculiar delight in many parts of the world. We are told that in Africa crickets are reared on purpose for their voices, and sold to the people, who believe that the soothing cry induces sleep. In Madagascar also crickets are raised for their voices, and because they are believed to be sacred insects. The rich keep large cages of them.

A similar superstition is found among the Roman Catholics of Europe, who believe that the cricket is sacred, it having clung to the robe of Jesus and ascended with him into heaven. For this reason crickets are caught on Ascension Day and kept in little bamboo or wicker cages. The tiny prisoner is well cared for, since the length of time it can be kept alive decides as to whether its owner is to have a long or a short life.

In the island of Sumatra there is a black cricket which is regarded almost with adoration by the natives.

Its chirping cry has given the cricket its name among several nations, the French *cri-cri* being clearly onomatopoeitic, as are probably our name for it and the similar Dutch *krekkel* and the Welsh *cricell* or *cricella*.

In Jamaica the cricket is valued as an article of food, and far more than the locust or grasshopper it seems to have been used to cure the sick, a favorite mode of preparation being to reduce the little creature to ashes, and then apply it in various ways to suffering humanity.



Although the common brown crickets are vegetable feeders, they live on decaying matter rather than on growing plants, and while they occasionally help themselves to tubers and live roots and some kinds of fruit, on the whole they are not injurious to man's crops.

There are not many species of crickets, yet the family possesses some queer enough members, among them being the odd-looking Mole Cricket, all soft and downy like a mole and with his fore legs developed into broad tools for digging. As one would expect, being such a digger he lives in the ground, making long

tunnels, in some of which are chambers for holding the eggs.

Having taken to an underground life, he no longer needs hopping legs, and so we find his hind legs quite ordinary, all his genius, like that of the mantis, being expressed in the greatly modified fore legs.

The young mole crickets, however, are able to leap, and it is only after several years of growth that they acquire the limited, but for a mole cricket perfect, development of the underground dwellers. The wings are small, as one would expect, though they are by no means useless; for though the mole cricket is not noted for his power of flight, he frequently lifts up his voice, shouting *grew, grew, grew*, two or three times successively, and then after a pause beginning all over again. His voice is pitched lower than the voices of the other crickets, and he begins his *grew, grew, grew*, in the middle of the afternoon, the cry becoming more vigorous toward night. One would think such a life might subdue his tunefulness; but no, down in his dark burrow he shakes his little wings and sings away as merrily as the denizens of the upper world.

Since the mole cricket has a fondness for plant roots, he is a nuisance in some parts of the country, where he appears in large

numbers. Porto Rico has a mole cricket that she would be glad to donate to any one who would take it; for so effective is the little digger that it ranks as the most serious insect pest of the island, annually damaging the crops, particularly of sugar and tobacco, to the value of over one hundred thousand dollars.

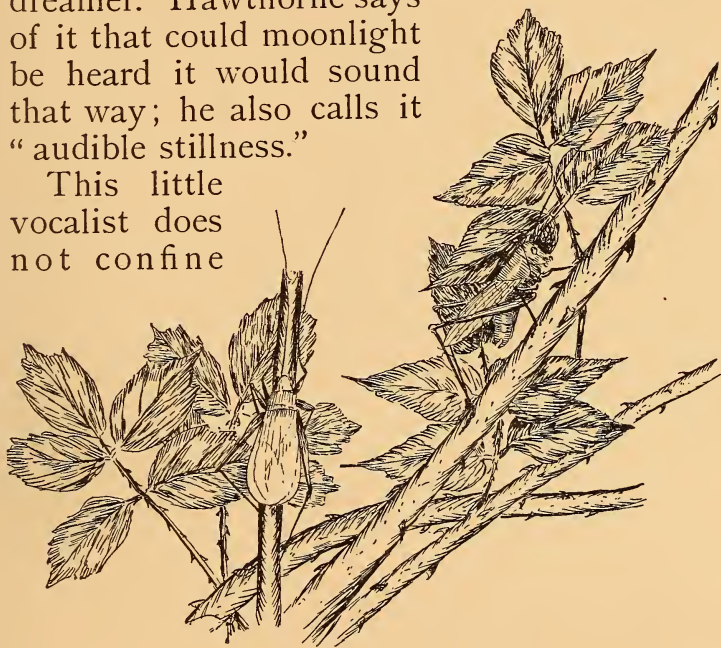
The most absurd of all the crickets are tiny flat creatures, about a tenth of an inch long, that live in the nests of ants. What they do there, and whether invited or not, I for one should like to know.

About as far from the mole cricket as anything well could be in personal appearance is the dainty little Snowy Tree Cricket, or Climbing Cricket as it is also called.

This fairy is pale green or ivory white, with very long antennæ. It is a little thing, its body being about half an inch long. Its wings, though longer than the body, are thin, transparent, and exceedingly delicate in appearance. But with these fragile organs it can make the night ring. Who has not heard of a summer evening a shrill *re-teat, re-teat, re-teat*, endlessly repeated? Who makes this sound? Some strange little lizard or tree-frog up in the branches over our heads? No, this voice which has puzzled many a listener—for the vocalist is less often seen than any of the others—comes

from the snowy tree cricket; a voice so dreamy at times and so pervading that it has attracted the notice of many a human dreamer. Hawthorne says of it that could moonlight be heard it would sound that way; he also calls it "audible stillness."

This little vocalist does not confine



his singing to the still hours of the night, but chirps away in the daytime as well, though his day song is far less noticeable in the chorus of other insects than in the comparative stillness of the night. Nor, we are told, is his song quite the same at night as in the daytime, the difference in temperature probably accounting for the difference in sound, for many insects give shriller notes

under the influence of the warm sun than in the lower temperature of the night.

The snowy tree cricket ought to be man's friend, since it lives on plant lice and other injurious insects, but it has an unfortunate habit of choosing the pithy stems of berry bushes in which to lay its eggs. It pierces holes with its strong ovipositor and often so weakens the stem that it breaks off in the wind and is unable to produce fruit. In some places where blackberries and raspberries are raised for market this dainty sprite has proven to be a veritable nuisance. But on the whole we can forget its misdeeds and listen to its voice with unmixed pleasure.

The dreamy cry wavering through the moonlight night is a fitting good-bye from the grasshopper tribe to the summer idler who has spent his days dallying with the absurd little people.

Index

Index

ABDOMEN of grasshopper, 92-97, 99, 100
African locust swarms, 134-138, 190; used as food, 174-179
Air tubes of insect, 95-97
America and the locust plague, 142. *See* Rocky Mountain locusts
 and United States
Anacreon's reference to mantis, 111
Antennæ of insects, 75-83, 90-92
Ants — what it means to them to lose their antennæ, 83
Apocalypse, quoted, 147, 195, 243
Appetite of grasshoppers, 51, 55, 57, 58, 85
Arabian legend concerning locusts, 150
Arctic hare, protective coloring of, 67
Argentine Republic locust swarm, 148, 199
Armor, or bony skeleton, of grasshopper, 242
Artificial locust eggs, trade in, 215, 216
Ascension Day crickets, 269
Australian locust plague, 142
Austrian katydid, 254, 256

BAGDAD, 180
Balance of the body in jumping, 22, 23
Bees, spines on the legs of, 25; eyes, 75; how to hold, 98; ovipositor
 and sting, 101, 102, 104; honey-bees, 104
Beetles, 37, 50
Bible, quoted, 134, 135, 143, 157-159, 189, 190
Birds feed upon locusts, 240
Blood, shed by oil-beetle, 89; the nutritive fluid of insects, 96, 97
Body parts of grasshopper, 17, 18
Brain of grasshopper, 41, 71, 72
Breathing apparatus of grasshopper, 95, 96
Bushmen's locust food, 177
Butterfly, thorax of, 19

CANADIAN provinces wasted by locust swarms, 206, 214
Canary Islands devastated by locust swarms, 139
Caterpillar, defensive odor of, 89; pores of air tubes, 96
Chilean Indians use locusts as food, 184
China and the locust plague, 141, 154; locusts an article of food, 181;
 means of driving them out, 192

- Chinese mantis fights, 117
 Chirping of grasshoppers, 59-65
 Chitin, 52
 Church warring against locusts, 193
 Cicada, 132
 Climate's influence over locust swarms, 237
 Climber, the grasshopper as a, 26, 30
 Climbing cricket. *See* Snowy tree cricket
 Cockroach, 79, 80, 88, 108, 110
 Colorado locusts, 212, 213
 Colors of grasshoppers, 26, 49, 66-70; of tumblebugs, 39; of beetles, 50; protective, 66; of frogs, 66; of arctic hares, 67; of lizards, 67; of crickets, 67; of katydids, 67, 254; of peacocks, 69, 70; of mantises, 122; of walking-sticks, 126
 Cowper, William, quoted, 264
 Cricket-like grasshoppers, 258
 Crickets, 61, 65-68, 88, 99, 257, 260-274
 Croton bugs, 110
 Curative power ascribed to mantis, 115
 Cyprus, locusts in, 150; how they have affected its history, 168-172
- DARWIN, Charles, quoted, 148
 Defensive odors and exudations, 84-90
 Democritus, quoted, 191
 "Devil-horse," 111. *See* Mantis
 Diary of a locust, 218-230
 Dickens, Charles, quoted, 260, 267
 Digger Indians as locust-eaters, 186, 187
 Diodorus Siculus, quoted, 181
 Disks on feet of flies and grasshoppers, 26-30
 Dried locusts an article of commerce, 179
 Drill, ovipositor used as a, 99, 100
 Drones, 102
- EARS, grasshoppers', 40-43, 72; crickets', 266
 East Indies devastated by locust swarms, 141
 Eggs, of grasshopper, 100, 101, 104, 105, 131; of mantis, 122; of walking-stick, 127; of katydid, 253, 254. *See* Locusts
 Egyptian locusts, 134
 Egyptian scarab, 40
Empire County Argus, quoted, 186
 "Entomology," Packard, 208
 Europe devastated by locust swarms, 138-141, 149, 152-154
 European cricket, 266
 Eyes of grasshopper, 72-75
- FEET of grasshoppers, 21, 26-30; of flies, 26-29
 Female grasshopper dumb, 64, 65; cricket, 261, 265
 Fighting crickets, 263, 266, 267

- Fires on mountain tops destroy locust swarms, 155
- Flies, feet of, 26-29; antennæ, 81; feed upon locusts, 238
- Food, locusts used as, 173-188
- Foot-pads of flies and grasshoppers, 26-30, 92
- Fowls feed upon locusts, 240
- Frogs, as jumpers, 22, 23; protective coloring of, 66
- Fungus destructive to locusts, 237

- GOVERNMENT extermination of locusts, 216, 217
- Grasping *Orthoptera*, 108
- Great lubber grasshopper, 235, 236
- Greek reverence for mantis, 112; use of locusts for food, 183
- Green blood of Florida fly, 96

- HARVEST-FLY, 132
- Hasselquist, —, quoted, 184
- Hatching of grasshoppers' eggs, 51, 101, 105
- Hawthorne, Nathaniel, quoted, 273
- Head of grasshopper composed of rings, 93
- "Health food" possibilities of the locust, 187
- Hearing-sense of insects, 43, 266
- Hiding on a grass stem, 30
- "History of the West Indies," Martyr, 185
- Hogs feed upon locusts, 241
- Holmes, Oliver Wendell, quoted, 250
- Homer, quoted, 61
- Honey-bees, 104
- Horse-like appearance of grasshopper, 243
- Hottentot superstitions concerning mantis, 113; use of locusts as food, 177; superstitions about locusts, 195
- Hunt, Leigh, quoted, 244
- Hunter wasps, 103

- INDIA and the locust plague, 142-144
- Insects' legs, number of, 13
- Insect sounds inaudible to some, 257

- JAEGER, the naturalist, quoted, 146, 152
- Jamaica, crickets in, 270
- Japanese caged insects, 256
- Javanese mantis fights, 117
- John the Baptist's food of locusts, 183
- Jumping *Orthoptera*, 108
- Jumping power and apparatus of grasshoppers, 11, 12, 16, 20-24, 26; of man, 21, 23; of frogs, 22, 23

- KANSAS locust swarms, 212
- Katyids, protective coloring of, 67, 254; antennæ, 81, 82; general characteristics, 244, 250-256
- Keats, John, quoted, 249, 260
- Kick of grasshopper, 24, 25

LARGEST locusts of tradition, 197

Layard, Austen H., 180

Leaf-insect, East Indian, 129

Legs of grasshoppers, 11-13, 16-26, 33-35, 60; of various insects, 12, 35, 37, 40

Lesser migratory locust, 235

Life-span of the grasshopper, 45, 57; of insects, 104, 105

Lizards, protective coloring of, 67; feed upon locusts, 241

Locusts, characteristics of, 131, 132, 134; derivation of name, 132, 133

Eggs: manner of laying, 131, 163, 164; breeding-place in Hungary, 149; extermination, 149, 150, 210, 211, 214-217; collection of, 150, 163, 215, 216; favorable breeding-places, 161, 204, 205, 207, 209, 211, 212, 214.

Swarms: breeding-places, 134, 160, 162, 163, 168, 198, 200; carried into sea, 135, 136, 138; cause pestilence, 136, 138, 208; cause famine, 137, 143, 144, 163, 203, 205, 207; travel on wind, 138, 160, 166, 204, 209-211; in Italy, 138; in France, 138; in Canary Islands, 139; efforts to exterminate winged swarms, 140, 151, 154, 155, 207; universally destructive, 140; in Europe, 140, 141, 152-154; ate garments, etc., 141, 207, 213; in East Indies, 141; in China, 141, 154; in Philippines, 142; size of swarms, 142-144, 146, 148, 153, 206; in Australia, 142; in New Guinea, 142; in India, 142-144; in United States, 142; formation of swarm, 144, 146, 148, 196, 197; alighting, 145, 146, 202; armies, trains, etc., stopped, 146, 147, 208, 212; noise of flying swarm, 147, 149, 202; sound of feeding, 148, 202; fecundity, 149, 151, 201; efforts to exterminate wingless swarms, 152-154, 167, 170-172; cross mountains, 154, 155, 160; arrival and departure, 157, 158, 162, 208, 209; elevation at which they fly, 159, 160; why they migrate, 161, 162, 167, 201, 203, 204; wingless swarms, 162, 164, 165, 205, 208; in Cyprus, 168-172; as food, 173-188; dampness fatal, 204, 205, 208, 209, 237; length of flight, 210; superstitions, 188-196; Rocky Mountain species, 199-217, 231

Long-horned grasshoppers, 81, 99, 244

Love calls of insects, 59, 65, 248, 249, 262

MANTIS, 35-37, 87, 88, 108, 110-123

Martyr, Peter, quoted, 185

Mating of grasshoppers, 59, 62-65, 69, 70

Mattei, Count, of Cyprus, 170

Meadow grasshoppers, 244-249

Medicinal use of locusts, 197

Migratory locusts. *See* Locusts

Milton, John, quoted, 269

Minnesota and migratory locusts, 206, 207, 215

Missouri State entomologist's locust banquet, 188

Molasses of grasshoppers, 84-86, 99

Mole cricket, 270-272

"More foolish than a cricket" (French proverb), 267

- Moslem veneration for mantis, 114
- Moulting process of grasshopper, 51-56
- Mouth fingers. *See* "Whiskers"
- Mouth, grasshopper's, 84, 85, 90
- "Mule-killer," or mantis, 87

- NAMES applied to cricket, 270
- Nervous system of insects, 71, 72, 74
- New England locust, 232-235; meadow grasshoppers, 245, 246
- New Guinea and the locust plague, 142
- Niebuhr, —, quoted, 184
- North Dakota, extermination of locusts in, 215

- OIL-BEETLE, 89
- Organization of locust swarms, supposed, 196
- Orthoptera*, 107-109
- Ovipositor of insects, 99-103

- PACKARD's "Entomology," quoted, 208
- Parasites on locusts, 239
- Pausanias, quoted, 188
- Peacock, colors of, 69, 70
- Pedigree of the locust, 196
- Phasmidæ*, 125
- Philippine Islands and locust plague, 142
- Pigeons, 108
- Pliny, quoted, 155, 182, 197
- Porto Rico mole cricket, 272
- Praying mantis. *See* Mantis
- Prongs on grasshoppers' tibiae. *See* Spines
- "Prophet," 111. *See* Mantis
- Protective coloring, 66-68; as illustrated by mantis, 122; walking-stick, 126

- QUEEN BESS, a pet mantis : her story, 118-121

- "REAR-HORSE," 111. *See* Mantis
- Red-legged locust, 232-235
- Ring structure of grasshopper's body, 92-96
- Rocky Mountain locusts, 199-217, 231
- Running *Orthoptera*, 108, 110

- ST. FRANCIS, quoted, 113
- Scarab, image of the tumblebug, 40
- Scent glands which attract, 89, 90; *compare* Defensive odors and exudations
- Selection, the influence of color and song upon, 69, 70
- Shards, 50
- Shell of grasshopper's egg, how broken, 25
- Shield-back grasshoppers, 258

- Short-horned grasshoppers, 81, 99, 131
 Sight-sense of grasshopper, 73
 Skeletons, insects', 52
 Skunk's defensive odor, 86
 Slippery surface ruins a jump, 24, 26
 Smelling-sense of insects, 76-79
 "Snake-doctor." *See* Mantis
 Snakes feed upon locusts, 241
 Snowy tree cricket, 272-274
 "Soothsayer," 111. *See* Mantis
 Sounds made by insects, 57, 59-63, 97, 246-254, 256, 261, 262, 264, 265, 269, 271
 South American mantis, 117; locust swarms, 184, 198, 199
 Southern locusts and grasshoppers, 235, 236, 259
 Southern superstitions concerning mantis, 114; mantis fights, 117; superstitions about crickets, 268
 Southey, Robert, quoted, 147
 "Spectre," 125. *See* Walking-stick
 Spider's legs, number of, 13
 Spines on grasshoppers' tibiae, 23-26; on legs of bees, 25
 Spiracles on grasshopper's thorax, 97
 Stings, 101-104
 Stink-bug's defensive odor, 86, 87
 Suckers, 28
 Sun genial to grasshoppers, 10, 11
 Superstitions concerning mantis, 111-115, 120, 121; concerning locust, 188-195; concerning cricket, 267-269

 TACHINA FLY, 239
 Tartar superstitions concerning locusts, 192
 Texas and the migratory locusts, 208, 213
 Theocritus's reference to mantis, 112
 Thorax of grasshopper, 17, 18, 22, 93; of butterfly, 19
 Thousand-legged worms, 18
 Toads feed upon locusts, 241
 Toilet-making of the grasshopper, 30-32, 90-92
 Transformations of animals and plants, supposed, 129, 130
 Tropical grasshopper species, 258
 Tumblebugs, 38-48, 81, 82
 Turkey feeds upon locusts, 240, 241

 UNITED STATES, locusts in the: used as food, 186-188; native species, 198-217, 231-236

 VARIATIONS in chirps, 63
 Vocal power of insects, 97

 WALKING-STICK, 88, 108, 124-128
 Wall carvings, locusts pictured in, 180
 Wasps, 103, 238

- Water bugs, 110
- West Indian natives use locusts as food, 185
- Wheat-field, a refuge for grasshoppers, 46, 255
- "Whiskers," or finger-like processes of grasshopper's mouth, 84, 90, 91, 95
- White, Gilbert, of Selborne, quoted, 264
- Wing covers, grasshoppers', 48-51, 56, 60, 249
- Wings, Grasshopper, 45-51, 55-64; as basis for classification, 107;
 of walking-sticks and leaf-insects, 127-129; of katydids, 253, 254;
 of crickets, 265
- Worm origin of insects, 75, 93-95, 103

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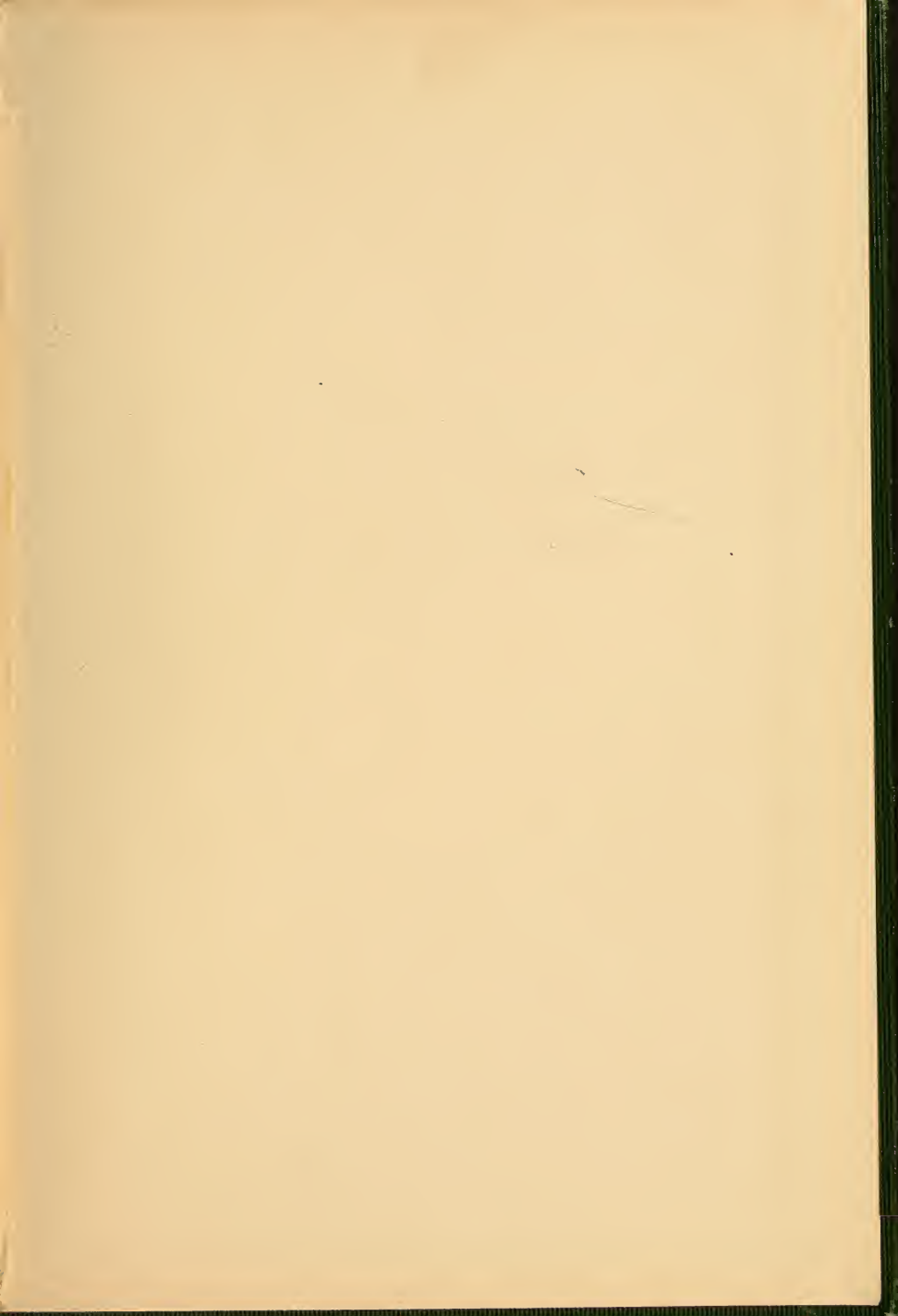
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